

TECHNOLOGY DEPT.

ROADS AND STREETS

JANUARY 1943

In this Issue — *Alcan Highway*

Winter Scene Along Alcan Highway

POWER

and Traction



TO KEEP YOUR GRADERS ROLLING FOR VICTORY...

- ✓ Check condition of engine regularly.
- ✓ Change lubricating oil and renew filter elements every 100 hours of use.
- ✓ Lubricate all parts of grader regularly.
- ✓ Service air cleaner every 10 hours of use.
- ✓ Clean fuel oil filters at least every 60 hours.
- ✓ Don't ride clutch. Adjust clutch pedal when and as needed.
- ✓ Keep electrical system in good condition —check battery regularly.
- ✓ Keep lost motion out of grader—use adjustments for wear and replace parts worn out.
- ✓ Keep tires inflated to recommended pressure.

If you need help or advice on any of the above, see your local Adams distributor.

★ ★ **P**OWER and **T**RACTION are what it takes to get mammoth army trucks over rough roads in all kinds of weather to bring vital supplies to the fighting fronts . . . **P**OWER and **T**RACTION are enabling Adams Motor Graders also to work in soil conditions ranging from sticky mud to loose sand to complete wartime grading and ground leveling jobs quickly and economically . . . **P**OWER and **T**RACTION are but two of the many features you'll like in Adams Motor Graders when once again you are permitted to buy equipment for use on peace-time projects!

J. D. ADAMS COMPANY • INDIANAPOLIS, INDIANA

Adams motor graders, leveling wheel graders, elevating graders, hauling scrapers, tamping rollers, bulldozers and road maintainers are used by allied forces throughout the world.

Adams

**ROAD-BUILDING AND
EARTH-MOVING EQUIPMENT**

FOR OUR ARMED FORCES

INDUSTRIAL AMERICA HAS PLEDGED

ALL-OUT AND EVER-INCREASING PRODUCTION

FOR OUR ARMED FORCES

—THAT THEY MAY QUICKEN THE DAY OF VICTORY

—THAT THEY MAY RETURN IN SAFETY

—AND THAT THE WORLD MAY BE ASSURED

OF A LASTING PEACE



R v. 86

ROADS AND STREETS

Vol. 86, No. 1

January, 1943



A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations, and grade separations; and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD
ROADS MAGAZINE AND ENGINEERING & CONTRACTING

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By HAROLD J. McKEEVER
Associate Editor, Roads and Streets

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1943

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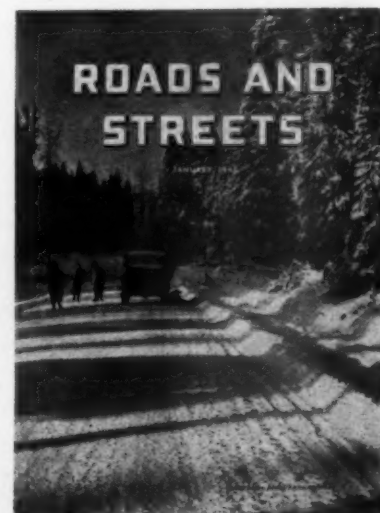
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It was just zero on the November morning when editor McKeever snapped our cover scene on Alcan Highway. The men are running up and down to get warm while the driver fixes his chains

Tech

WHAT ABOUT DRIVE
AND IDLER ROLLERS?

BUILDING
UP TREAD
TEETH...

REPAIRS TO DRUMS
AND BEARINGS...

THEW-
LORAIN

Emergency
FIX-IT
Handbook



HOW TO RESHAPE
TREAD PINHOLES...

24 PAGES of How to Keep 'Em On-the-Job IDEAS

HERE'S a brand new handbook for all Lorain owners and operators, full of practical ideas on how to make quick, emergency repairs that will keep your machine going. It will tell you how to temporarily substitute for critical, hard-to-get parts and materials—how to do more with what you've got.

Many of the suggestions are temporary expedients only, but they will keep your machine on the job—they will help to salvage and conserve worn parts, and will save you time and money, too. Write for your free copy of the Fix-It Handbook now or clip and mail the pledge form below if you want both the Handbook and a Conservation Emblem.

HOW TO GET THIS CONSERVATION EMBLEM

If you want to show others that you are helping to make your equipment last longer, sign and mail the pledge form below. Regardless of the type or make of your equipment, we will send you a colorful red, white and blue emblem (actual size 5" diameter).

THE THEW SHOVEL COMPANY, Lorain, Ohio

I hereby pledge that I shall do all in my power to prolong the life of any construction equipment in my ownership or care regardless of type or make.

I realize that it is my responsibility to avoid time-consuming delays caused by mechanical breakdowns and will see that frequent inspections are made and that necessary adjustments and repairs are promptly taken care of.

I will avoid waste of parts and materials and will eliminate any abuse of my equipment due to non-recommended operation.

Signed _____

Street Address _____

City _____

State _____

FIX-IT Handbook Wanted..... Lorain Model No..... Serial No.....

THEW-LORAIN

CRANES • SHOVELS
DRAGLINES • MOTO-CRANES

MORE YEARS OF LIFE FOR YOUR BLACKHAWK HYDRAULICS



"I'll Protect Your POWER-PACKERS and Blackhawk Hydraulic Rams"

HEEED THIS WARNING — and the Blackhawk Hydraulic Units on your snowplows and other road machines will continue to give you dependable, trouble-free service year in and year out.

Do not use hydraulic brake or shock absorber fluids, alcohol, glycerine, castor oil, etc. These fluids damage packings, dissolve the "sizing" which seals the pores in cup leathers, and corrode the surface of valve seats and cylinder walls.

Use *nothing* but *Blackhawk Hydraulic Jack Oil* which is especially selected to assure quick, free action in cold weather. The use of substitutes seriously cuts down the life of your Blackhawk Hydraulic Rams and Power-Packer Controls.

All your equipment is too valuable today — too hard to replace — so heed not only this warning concerning Blackhawk units, but the service suggestions of other manufacturers as well.

A Product of **BLACKHAWK MFG. COMPANY**
DEPARTMENT RS MILWAUKEE, WISCONSIN



Use only Blackhawk Hydraulic Jack Oil
— available in 1 Quart, 1 Gallon,
5 Gallon and 34 Gallon Drums.



A SALUTE to the Nation's War Effort

★ Since Pearl Harbor, our Nation has amazed the world with its speedy transition to war production. Today its tanks, ships, planes and guns, as well as its fighting men, are dealing telling blows on every far-flung fighting front. Marion salutes the Nation's war effort and is proud of the part it is playing in the production of vital raw materials and the construction of war plants. Victory is bound to be the reward of such determined effort.

THE MARION STEAM SHOVEL CO.
Marion, Ohio, U.S.A. *Offices in all principal cities*



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SHOVELS • DRAGLINES • CLAMHELLS
CRANES • PULL-SHOVELS • WALKERS
Gasoline — Diesel — Electric — $\frac{1}{4}$ cubic yard to 35 cubic yards



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THE GALION IRON WORKS & MFG. CO.

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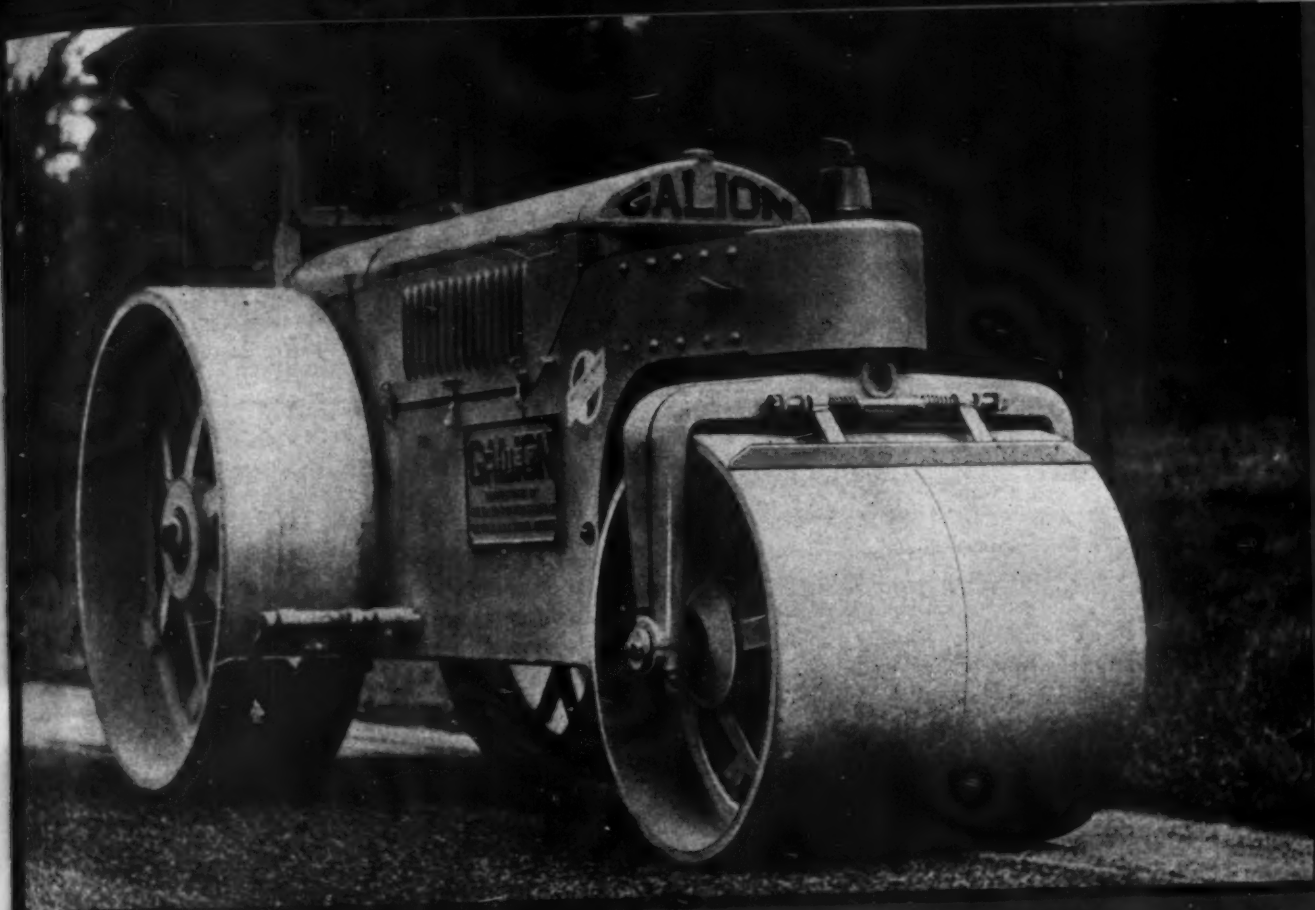


GALION, OHIO



S

O.
HIO



POINTS TO ULTIMATE VICTORY



WARTIME HELP

..to Lengthen Tractor Life... Reduce Upkeep

As America goes "all-out" . . . more and more tractors are needed by our armed forces. This means you have to take better care of your present machines than ever. Every one "kept rolling" means one more for Uncle Sam. To help you make 'em last . . . Allis-Chalmers suggests these wartime helps on tractor care and maintenance.

① TRAIN YOUR OPERATORS . . . All your tractor operators should know how to take care of your tractors. Start your own service school. Call your tractor operators together at the most convenient times and let your head mechanic or seasoned operators instruct them. Or try to arrange with your Allis-Chalmers dealer to send over one of his mechanics to conduct your service school. If it is at all possible, he will be glad to cooperate. Have everyone attend that has even the remotest connection with your tractors. The operator's job will be made easier . . . and it will be easier on your machine and pocketbook! Use this preventive maintenance plan!

② CHECK TRACTORS FREQUENTLY

Inspect and overhaul your tractors at frequent intervals. Keep tracks at proper tension, make wear take-up adjustments as necessary, replace worn parts before they can damage the surrounding mechanism, lubricate according to instructions. You'll not only save your machine . . . you will save critical material . . . save plenty of grief, time and money. Call in the skilled help of your Allis-Chalmers dealer for inspections, overhauls, rebuilds, repairs. He will do the work right, at lowest cost and with genuine parts. His knowledge and experience are always at your command!

Start your wartime training and maintenance program now! Regardless of how soundly constructed, a tractor will produce with high efficiency only if it is carefully operated, well lubricated, properly serviced!

ALLIS-CHALMERS
TRACTOR DIVISION, MILWAUKEE, WIS.



★ WARTIME SERVICE FROM YOUR ALLIS-CHALMERS DEALER

- 1 PARTS ASSISTANCE—Information on how to get parts and who can obtain them.
- 2 PRIORITY ASSISTANCE—Who can get new equipment and how! Up-to-date information on latest regulations.
- 3 LIMITATION ORDERS—Interpretation of latest government limitation orders affecting construction equipment.
- 4 SUBCONTRACT INFORMATION—Frequently dealers possess information on subcontract opportunities.
- 5 REBUILDING FACILITIES—Enlarged, modern shop facilities to handle rebuilding with speed and efficiency.
- 6 SERVICE EDUCATION—Instructions on how to operate and service equipment correctly. Provides service school—instructors.
- 7 REPAIRS AND MAINTENANCE—Quick, efficient repairing by skilled, factory-trained mechanics, using the right tools and genuine parts.
- 8 USED EQUIPMENT—In some instances, good rebuilt construction equipment may be available.
- 9 RENTALS—A-1 equipment rented at nominal charge.
- 10 EQUIPMENT EXCHANGE—Serves as information center on used equipment available in territory.

RESERVE POWER FOR HIGH OUTPUT



Koehring Shovels Have It

Koehring shovels have the reserve power and the stamina to take the extra burden of 'round the clock performance day after day. The extra speed which has helped them set output records on ordinary work is now helping to do the extraordinary job required. Sustained output is assured by the ability of Koehring shovels to take hard service with little time out for breakdown or repair. These features keep Koehring shovels digging hard; all welded construction . . . chain crowd . . . self-cleaning crawlers . . . heavy duty motor . . . welded dipper . . . and many more.

KOEHRING COMPANY • MILWAUKEE, WISCONSIN



HEAVY-DUTY CONSTRUCTION EQUIPMENT



Clean as a Smooth Shave

WHEN YOU PEEL PACKED SNOW

SCRAPING hard-packed snow and ice from a busy roadway is a job that calls for specially designed trucks equipped with pressure center scrapers. A front-mounted plow cannot exert the pressure needed for this work. Outstanding results are obtained with Walter Snow Fighters, mounted with Walter Pressure Center Scrapers.

Only with the unique Walter Four-Point Positive Drive is it possible to obtain the steady flow of power necessary to insure a smooth, uninterrupted scraping action. The scraper is so designed as to surmount road obstacles without damage to scraper, truck or road . . . and the entire unit is so flexible that it can wind in and out of traffic quickly and easily. When there is a heavy snowfall, it is only necessary to add the V Plow and side wings as shown in the photograph at the right. Write for details.

WALTER MOTOR TRUCK CO.
1001-19 Irving Ave., Ridgewood, Queens, L. I., N. Y.

with
**WALTER
SNOW
FIGHTERS**



Meet the faster
construction demands
of the

SOS

SERVICE OF SUPPLIES

You can depend on
Blaw-Knox
construction equipment

Get the vital construction jobs done quicker with dependable Blaw-Knox Construction Equipment. Improved, up-to-the-minute design, sturdily built for round-the-clock operation; trouble-free service—all add up to peak performance.

Ask your nearest Blaw-Knox Distributor to tell you about this time saving equipment.

BLAW-KNOX

BLAW-KNOX DIVISION of Blaw-Knox Company

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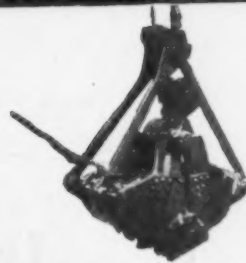
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CONCRETE MIXERS

CONCRETE SPREADERS • ROAD FORMS • TRUCK MIXERS • CLAMSHELL BUCKETS • CONCRETE FINISHING MACHINES • BINS AND BATCHERS • CONCRETE BUCKETS • STEEL STREET FORMS • BULK CEMENT PLANTS • PORTLAND CEMENT MIXING PLANTS • TRUCK TURNABLES • TAMPING ROLLERS

It's Hard
to Get Steel
**BUT YOU
CAN GET
DRAINAGE**



• America at war can afford no interruption of vital traffic. Proper drainage is doubly important now. Yet desirable as it is, steel must not be used in any drainage structure unless engineering integrity demands it. Even so, perhaps we can help you in other ways.

For example, ARMCO Emergency Pipe may be just the answer to your wartime drainage problems. This completely new design in wood pipe requires no steel sheets, bands, wire mesh or metal reinforcing. It

is easy to handle and has ample strength to meet engineering standards. ARMCO Wood pipe is designed to last through the emergency. On more permanent installations, when replacement becomes necessary, a corrugated metal pipe may easily be threaded through or jacked around the wood structure.

Remember that ARMCO Corrugated Metal Pipe is only on temporary "leave of absence." It will be back with its flexible strength, ease of handling, tight joints, long


lengths and low installation costs. Asbestos-Bonded Coatings and thick bituminous pavements will be back too—better than ever before—to guard against corrosion and erosion.

Meanwhile, can we assist with your drainage problems? The answer may be in the use of non-strategic materials, or in suggestions for repairing and salvaging older structures. Write to us for information. Armco Drainage Products Association, 15 Curtis St., Middletown, O.

ARMCO



EMERGENCY PIPE



Keeping a Time Honored Tradition Alive

*and Making the New Year
a Living Issue*

Again, the time is at hand, when that wholesome American custom, of extending Greetings and New Year's Wishes, is observed by men of all stations and walks of life. It is a time of goodwill that springs from a spirit, grateful for the things we have and enjoy as a liberty loving people. And, it is a time of inventory and resolve—when the worn page of the past year is reviewed, turned and a new one greets us as we make a fresh start.

While endeavoring to look ahead, the year 1943 takes on a new significance. Heartened by what our armed forces are doing, we as a Nation have been spurred to greater action. And many of us, now more than ever, are striving to match the valor and sacrifice of our boys, so that throughout the coming year we can be happy in the thought of jobs well done—jobs that will hasten early victory and preserve that which we cherish and hold dear.


It is in this spirit, coupled with a desire to be of the greatest possible service, that we and all Austin-Western Distributors extend to you and yours our wishes for health and success, here at home as well as abroad.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

Aurora, Illinois, U. S. A.

Distributors in Principal Cities • Cable Address: Awco, Aurora

Austin-Western



Cedarapids Equipment helps do the Impossible...

on the toughest highway job ever undertaken

The Alcan Highway! Its completion is another case of accomplishing the apparently impossible. We are proud—and we know the Contractors and the War Department are grateful—that Cedarapids Morok and Junior Tandem portable crushing plants had the performance ability to meet the speed, tough conditions, and rigid specifications of this great job.

for your aggregate-producing needs

Investigate the superior feeding, crushing, screening, truckloading and portability features of Cedarapids Tandem Plants. Models to meet all conditions. Also write for complete information about other Cedarapids equipment for stone-crushing, material handling, and asphalt-mixing.

Cedarapids

Master Tandem portable crushing plant for gravel or rock. Big capacity. Low-cost operation. Drives without chains or sprockets.

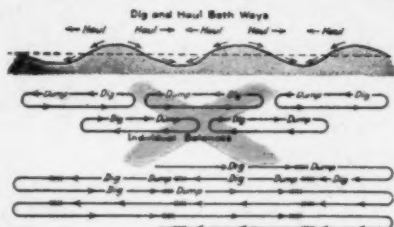


Made by IOWA MANUFACTURING COMPANY • Cedar Rapids, Iowa, U. S. A.

Increase Yardage and Profits with This Job-Proved Cut-and-Fill Method

You'll Make Fewer Turns, Yet Move More Loads in Less Time with Your Present Equipment . . . Try It!

Big-capacity LeTourneau Carryall Scrapers make big yardage gains out of the turning time saved on this series of cuts and fills on a West Coast access road. What's more, turn elimination reduces wear on tracks and steering clutches.



Here's a cut-and-fill method applicable to almost every earth-moving job in rolling country. You will find it eliminates extra turns, reduces round-trip time, and thus increases the number of big loads you can move with your present Tournapulls and tractor-drawn Carryall Scrapers.

Using individual balances, 10 turns are required to deliver 5 pay loads. By balancing the series of cuts and fills, so you can haul in both directions, you deliver 5 pay loads with only 2 turns. Each turn eliminated gains an average of 0.25 min. or 2 full minutes on this cycle.

Gain \$31.50 per Day

Assume a 10 pay yard load and 5.0 min. per load, then on the basis of individual balances you

could deliver 120 cu. yds. hourly. With the above turn-eliminating cycle, you save 2.0 min. each 5 loads and increase your hourly yardage to 130 cu. yds. That's a gain of 210 extra yards per Carryall Scraper each 21-hour day. At 15¢ a cu. yd., this elimination of turns amounts to \$31.50 per day or \$15,000 on a 10,000 hour operating life!

Figure the increase in yards and profits for your job and Carryall Scraper fleet. The gains will vary with the Scraper size and haul distances, but you'll find the method always increases the number of loads and yardage—without an increase in equipment. Put this Victory-speeding method to work TODAY.

LETOURNEAU

Manufacturers of DOZERS, CARRYALL* SCRAPERS, POWER CONTROL UNITS, ROOTERS*, SHEEP'S FOOT ROLLERS, TOURNAPULLS*, TOURNAROPS*, TOURNATRAILERS*, TOURNAWELDS*, TRACTOR CRANES.

*Name Reg. U. S. Pat. Off.

LeTourneau - "Caterpillar" Dealers Well Equipped to Serve

No matter where today's wartime jobs take your equipment, you will find a LeTourneau-"Caterpillar" dealer service base near you. A recent survey of all LeTourneau-"Caterpillar" dealers in the U. S. and Canada (102 reporting) showed an average stock of LeTourneau parts of \$10,509.* That means in most cases your local dealer can furnish parts direct from stock.

101 of the dealers employ skilled welders. All but two have shop welding units. In addition, 80% have portable welding outfits, capable of getting to your job quickly to make in-the-field repairs. There's an average of 12 servicemen per dealer, many of them factory-trained.

Take advantage NOW of this time-saving parts and maintenance service—make your LeTourneau - "Caterpillar" dealer your Victory Construction Headquarters.

*This includes many small semi-agricultural dealers, who nevertheless stock parts and have excellent service facilities. Larger dealers carry up to \$65,000 in parts.



CONCRETE ROADS

are saving millions
of dollars on
surface maintenance

*Their superior stamina is
an important war asset*

Concrete highways, military access roads and streets are saving millions of dollars annually on surface maintenance—conserving large quantities of maintenance materials, and transportation facilities.

States with a substantial mileage of concrete pavement are better able to keep up with wartime maintenance demands, even with reduced revenues. The low maintenance cost of concrete is an important national asset.

Our technical staff is ready to assist military or civilian engineers in designing low maintenance cost concrete pavements for highways or airports using little or no steel.

Illustrated folder on "Construction of Concrete Pavement in Cold Weather," may be of interest to you NOW. Mailed free in U.S. and Canada.

PORTLAND CEMENT ASSOCIATION
Dept. A1-28, 33 W. Grand Ave., Chicago, Ill.

★ ★ ★ **BUY MORE WAR SAVINGS BONDS** ★ ★ ★



REQUIRES LESS CAPITAL INVESTMENT

You buy only the Wood Roadmixer. Standard crawler tractor, used for pulling and powering the Wood Roadmixer, and supply truck are usually available from existing rolling stock. This means an initial saving of thousands of dollars.

REQUIRES LESS EQUIPMENT

The Wood Roadmixer requires only two additional pieces of equipment, neither of which are permanently tied up. When the Roadmixer is not in use, the tractor and supply truck can be detached for other work, which eliminates costly idleness.

REQUIRES LESS MANPOWER

Any good scraper man can competently handle a Wood Roadmixer. On the average paving job only two men are needed—one on the tractor—one on the Roadmixer. Labor costs are held to an absolute minimum, manpower is efficiently utilized.

REQUIRES SMALLEST PRODUCTION

On many jobs in this country and abroad, Wood Roadmixers are delivering as much as 2,000 tons of mix per 8-hour day... These are reasons why this leading traveling plant method of pavement construction builds better paving for less money.



WOOD ROADMIXER

Wood Manufacturing Co. • 610 West 28th St., Los Angeles, California



IN WHAT COUNTRIES IS THE **SEAMAN PULVI-MIXER**
Doing Its **BETTER, FASTER, MORE**
ECONOMICAL Job of STABILIZATION ?

Frankly, we don't know every land in which the SEAMAN PULVI-MIXER is doing its job . . . but we are certain of one fact: where speed and thoroughness in stabilization or in-place mixing are essential, you'll generally find a SEAMAN! The rotary principle in pulverizing and mixing materials as pioneered by SEAMAN is the keynote to the success of the PULVI-MIXER. Revolving tines operating at high speed mix the materials with remarkable uniformity to the full depth of treatment. Speed and economy go hand-in-hand with thoroughness. In square yards of finished stabilization per hour of work . . . in low investment and operating cost, the SEAMAN PULVI-MIXER puts many dollars of extra profit into the contractor's pocket. . . . For any stabilization process — investigate the SEAMAN.

SEAMAN MOTORS

305 N. 25th STREET • MILWAUKEE, WIS.




VICTORY
CRANES**LIMIT****DRAGLINES · SHOVELS****PROGRAM**

To our many customers, prospective customers, and operator friends who are working both ends against the middle to help win the war, we extend our congratulations. The part you are playing in the victory program deserves the highest praise. Without your expert supervision, untiring efforts and the fine performance of your excavating and material handling machines, plans for an early victory could not materialize. No doubt, you are pushing your cranes, draglines and shovels to the limit, and in the rush to get things done faster, you may be neglecting to give your equipment the kind of attention it deserves. If this is the case, we urge you to take time out every day to inspect and service your machines. When new equipment is as difficult to get as it is today, it is doubly important that you take unusual care of what you have. Make it a 1943 resolution to do everything that you can to make your present equipment last longer — you will be doing yourself and country a big service.

**AN IMPORTANT
LINK IN THE
Victory
PROGRAM**

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division

LIMA, OHIO

 NEW YORK, N. Y.
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 MONTREAL, QUEBEC, CANADA

 MEMPHIS, TENN.
 LOS ANGELES, CALIF.
 ST. LOUIS, MO.

★ BUY WAR BONDS AND STAMPS



Write for a copy of "Timely Tips", a booklet full of information to help your operator get better and longer service from his machine.

LIMA
CRANES, 13 TONS TO 65 TONS**SHOVELS, $\frac{3}{4}$ YD. TO $3\frac{1}{2}$ YD.****DRAGLINES, VARIABLE**



Too bad they didn't have Baker Hydraulic Bulldozers during the Klondike Gold Rush. The way they performed on the Alaska-Canada Highway, and Airbase and Supply Depot construction up there, you would think they were first cousins to a Malemute sled dog. Bakers are tireless workers.

They helped to carve roads through spongy muskeg swamps—like eating soup with a fork—but they did it. They bowled over enough trees to keep a hundred pulp mills busy; made cuts in tough shale and heavy gravel; spread, graded and leveled; pushed mired dirt-buggies; rolled logs for bridges, and what-not. Bakers are versatile.

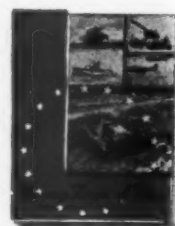
When the freeze set in, Baker's di-



rect hydraulic down pressure—which puts the full weight of the tractor front end on the blade—was just what was needed to get the finishing touches done.

Bakers keep delivering, even in the frigid zone—use plain fuel oil in the hydraulic system. Ask Comrade Ivan! Bakers took to the Russian tundra like a Siberian musk-ox. On every front, Bakers are bringing hydraulic pressure to bear on the enemy!

May we send a copy of "Unsung Heroes of War"?



THE BAKER MFG. CO.

506 Stanford Ave. Springfield, Ill.

BAKER

The Modern Tractor Equipment Line
for
EARTH MOVING
LEVELING AND GRADE BUILDING
SNOW REMOVAL
ROAD MAINTENANCE

18,000 MONOTUBES

Driven for Large Midwestern Steel Plant



A LARGE midwestern steel company recently used 18,000 tapered Monotubes in the construction of three new projects.

In Chicago, Monotubes were chosen because of their extra strength and rigidity. Driving had to be done through a clay formation to sand and gravel, much of it in ground filled with "skulls"—and that requires piles that can "take it"!

In Youngstown, Monotubes were considered best because of a confined and congested working area. Only piles that could be easily and swiftly handled with light, mobile driving equipment would suffice—and that's one of the chief qualities of Monotubes.

In Cleveland, Monotubes were used because of unforeseen ground conditions where length variations ran

as high as 100%—requiring flexibility as well as structural strength.

The experience of the engineers and contractors on these three jobs proves the Monotube features of (1) fast handling; (2) fast driving; (3) fast extension; and (4) ease of inspection.

Engineering & Design

Cleveland... United Engineers & Constructors, Phila.; also the owner's own engineering department.

Youngstown... United Engineers & Constructors

Chicago... James Stewart & Co., New York City (also Gen. Con.)

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Remember "More Production means Axis Destruction"



The UNION METAL Manufacturing Co.,

CANTON, OHIO

Reproduction of photo-mural, as shown in the Cleaver-Brooks offices, depicting representative Oilbilt steam plant installations.



The Cleaver-Brooks Principle of Oil-Fired Steam Generation . . . Finds a Vitally Important Application in Equipment for Our Fighting Forces



Reproduction of photo-mural which is a composite illustration of various types of Cleaver-Brooks equipment built for our armed forces.

Known for their efficient application of the multi-pass, down-draft heating principle, Oilbilt steam plants are providing steam for power and processing in hundreds of industrial establishments — helping them to meet record-breaking production schedules for war equipment.

Mobile equipment, employing the same proven principle of firing with America's ideal fuel — oil — and including hot water heating equipment,

special steam generating plants, portable shower bath units, distilling, sterilizing and disinfecting equipment, is contributing to the safety and comfort of our fighting forces wherever they are located.

Now manufactured for a nation at war, Cleaver-Brooks products will resume their peacetime service when Victory day comes.

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B-G representatives can be of valuable assistance to you during the present emergency. **PARTS** Many carry in stock the B-G repair parts most frequently required. Others can assist you in ordering parts. **MAINTENANCE** They will gladly advise you on general maintenance. Many are equipped to bring your machine in and completely overhaul it. **RENTAL** B-G representatives are glad to assist you in locating machines for rental or will assist you in renting a machine which you have idle. **ENGINEERING SERVICE** Your B-G representative will gladly give you the benefit of his experience in any proposed changes in your material handling layout. **NEW MACHINES** New Barber-Greene are not available except on very high priority. If you are planning a job which will carry such a priority, your B-G representative will give you every possible assistance.



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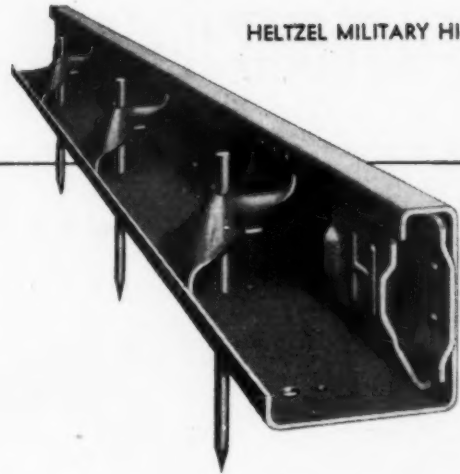
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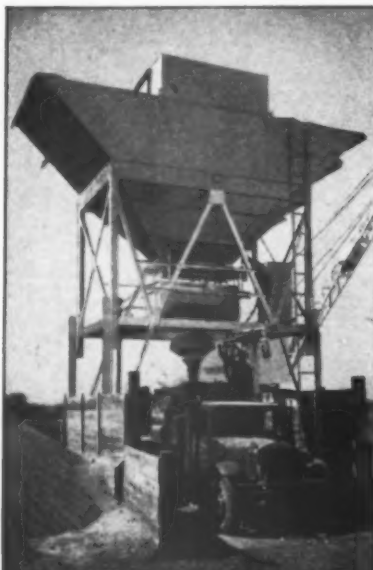
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ROADS AND STREETS, January, 1943

HELTZEL MILITARY HIGHWAY FORMS



★ HELTZEL BATCHING PLANTS AND STEEL FORMS

HELTZEL PORTABLE 100-TON
TRUCK MIXER CHARGING PLANTOTHER HELTZEL COST
SAVING EQUIPMENT...

GENERAL DUTY CONCRETE BUCKETS

WILL HAVE PLAYED AN IMPORTANT PART WHEN
THE LAST FOOT OF THE ALCAN HIGHWAY IS
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HELTZEL HAS ALWAYS BEEN THE LEADER IN
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EQUIPMENT IS BEING USED IN ALL PARTS OF
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WARREN, OHIO U. S. A.

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CAN
HELP
YOU NOW**



with a **BUCKEYE SPREADER**
you can do a Better **JOB** with Less
MATERIAL and Fewer **MAN-HOURS!**

THE savings in time and material you can show with a Buckeye spreader are more important today than ever before. Buckeye's extremely high accuracy (users report up to 98-99%) means that you spread *exactly* the amount of material required, uniformly . . . none is wasted, no "thin" spots are left to cause trouble later. Buckeye's high efficiency saves 15 to 20% in precious man-hours of labor, too!

Gear your spreader work to wartime needs . . . make scarce materials go farther, get the *most* out of every hour of time — put a **BUCKEYE** Spreader on your job **NOW!** Write or wire for complete information.

- Saves materials . . . 98-99% accuracy!
- Spreads forward or reverse.
- Spreads up to 6" deep course with strike-off attachment.
- Spreads dry, wet or slightly tacky materials.
- Puts the course down without need of raking or brooming.
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- Stops flow of material, without a dribble, at any time. This is automatic when truck stops.



THE BUCKEYE TRACTION DITCHER COMPANY • Findlay, Ohio

Built by **Buckeye** ✓

Check
Page 91

Convertible Shovels



Trenchers



Tractor Equipment



R-8 Finegraders

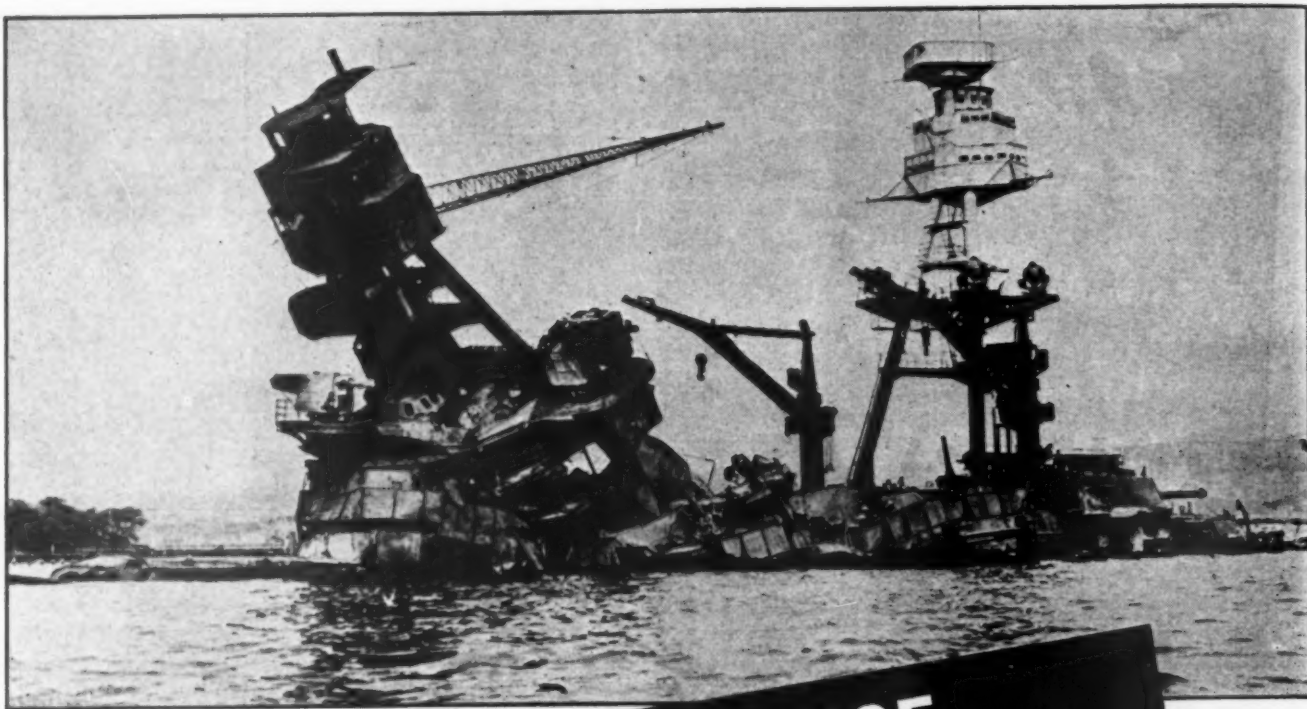


Road Wideners



Spreaders





Released Official U. S. Navy Photograph.
U. S. S. Arizona in Pearl Harbor.



Littleford Supply Tanks bring the Asphalt to the job. Pressure Distributors stay in action while the Supply Tank does the hauling from the source of supply.



Littleford Road Brooms sweep highways free of dust and dirt before the asphalt is applied. Littleford Brooms are made in Traction Driven or Power Driven Models.



"Spray Master" Pressure Distributor is the most modern spraying unit on the market today. It will handle Asphalt, Tar, Emulsion, Road Oil, or Cutback.



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We have put our efforts to winning the war. We're in this struggle up to our necks and proud of the chance to do our part. Needless to say, we are like most manufacturers—we cannot furnish equipment or parts without good reason. However, units now in the field doing important highway and airport construction or maintenance work can be helped through the Littleford Dealer Organization.

These Dealers have the facilities for repairing and servicing such Littleford units as Pressure Distributors, Supply Tanks and Road Brooms, Burners, etc. If they do not have parts in stock, we will try to do all in our power to supply them.

Remember, Littleford equipment is helping to win the war by keeping vital roads, airports, streets, etc., ready for action. There's a Littleford Dealer ready to serve you in every section of the country.



LITTLEFORD

LITTLEFORD BROS., INC.
454 E. Pearl Street, Cincinnati, Ohio

LITTLEFORD BROS., INC., CINCINNATI, OHIO

GOOD LUBRICATION WILL SMOOTH YOUR WAY TO VICTORY



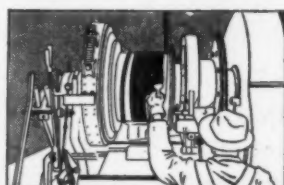
Proper lubrication can do more than any other single thing to keep your shovel stepping at top wartime speed. As a general rule, a little lubricant applied often is better than a lot used

spasmodically. Follow your manufacturer's complete lubrication instructions carefully, and you'll keep your shovel digging for Uncle Sam.

HERE ARE A FEW SPECIAL POINTS TO WATCH:

1

Ropes and drums should be lubricated regularly. Put a thin layer on often so the lubricant doesn't splatter in operation.



3

Lubricate cats even though your machine is not propelling much. Normal digging reactions shift the belts back and forth and cause wear.



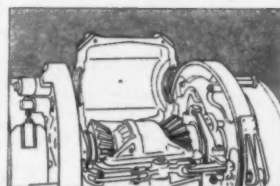
2

Be sure to lubricate suspension ropes. They'll rust their strength away if you don't.



4

Keep the proper amount of oil in your gear enclosures at all times.



Remember . . . **YOU NEED LUBRICATION
TO LAST THE DURATION**

Bucyrus-Erie employees have accepted the award of the Army-Navy "E" as a challenge to keep production rising. * *

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**CLEVELAND
CARTOONS**
tell how to
keep rock drills
on the job

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write for
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THIS booklet of Cleveland Cartoons presents, in an amusing style, useful hints on proper rock drill maintenance. It tells you and your men what you can do to get more work out of your tools with minimum expense for repairs and compressed air. Your men will enjoy the practical, down-to-earth style of these cartoons. It covers many important phases of operation such as lubrication, dull drill steels, worn chucks, cleaning, etc.

We have already received requests for thousands of copies of Cleveland Cartoons. In the interests of efficient wartime operation, write now for your free copy.

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A TYPICAL CLEVELAND CARTOON

DON'T USE DULL DRILL STEELS—When the bit, from wear or improper sharpening, loses its gauge, it will no longer be free in the hole and the blows of the hammer wedge it tightly, greatly slowing up, if not entirely stopping the progress of the drill. Never use dull steel. You get no drilling to speak of, and you put your machine in the repair shop besides.

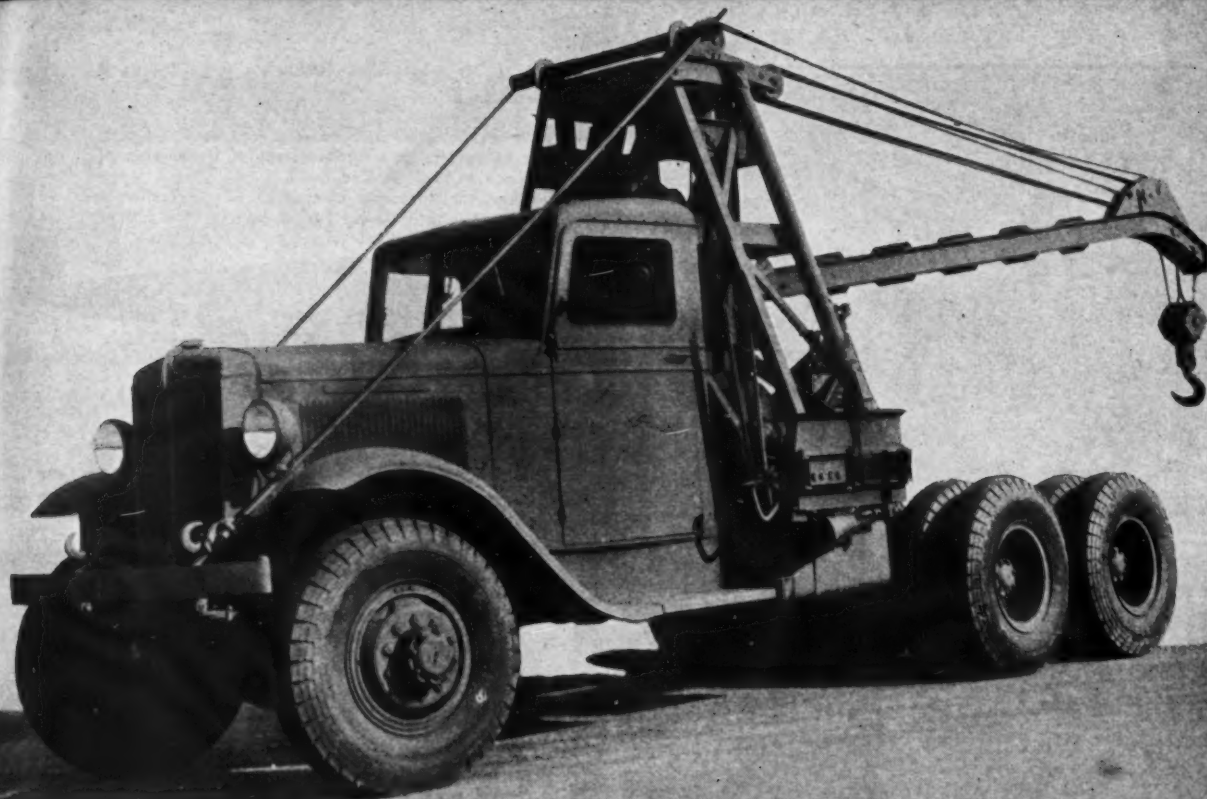
The **CLEVELAND ROCK DRILL CO.**

Subsidiary of The Cleveland Pneumatic Tool Company

CABLE ADDRESS: "ROCKDRILL"

CLEVELAND, OHIO

LEADERS IN DRILLING EQUIPMENT



EN ROUTE *to Russia, Africa
or the Solomons...*

★
★ **J**UST where this mammoth Marmon-Herrington *All-Wheel-Drive* wrecking truck (one of a large fleet) has gone cannot be told.

But whether it be to the snow-blown steppes of Russia, the steaming jungles of the South Pacific islands, or the battle-churned sands of Africa, it will prove equal to the job it has to do.

Ten big tires, each "alive" with traction, flowing from the powerful engine designed and equipped for the particular, difficult conditions under which it will operate, will take the great crane

wherever it is needed. *All-Wheel-Drive* will bring it through, where no conventional drive truck could operate.

Marmon-Herrington *All-Wheel-Drive* trucks were originally designed in the light of experience gained in the first World War. Lower center of gravity, better transmission of power to the front axle and easier, more dependable steering were just a few of the improvements incorporated in these trucks from the very first models.

The Marmon-Herrington principle of converting standard vehicles to *All-*

Wheel-Drive opened up a vast production of military trucks for the United Nations in record-breaking time. But MARMON-HERRINGTON "Heavy Duty" *All-Wheel-Drive* trucks, too, are doing their part in the winning of the war. Along with the high speed track-laying artillery tractors and combat tanks which this company is turning out by the hundreds, they are helping mightily in United Nations' victories on all continents.

You can buy a Marmon-Herrington sooner by buying War Bonds Now!

MARMON-HERRINGTON

All-Wheel-Drive

MARMON-HERRINGTON CO., Inc., Indianapolis, Indiana



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To conserve their fighting capacity they ride to battle on Rogers Trailers, or if damaged are transported to the rear for repairs on a retriever type of trailer especially equipped to load disabled tanks.

Meanwhile, thousands of standard Rogers Trailers are serving efficiently on our factory fronts or in transporting defense equipment to various fortifications.



MICHIGAN mobile CRANES

Do it **FASTER**
-- for **LESS!**

Precision CRANE WORK moves faster with hi-speed MICHIGAN Air Controls. Heavy loads handled safely — Low Gravity Center for Stability; Heavy Duty Motors for power with economy. . . . Your request will bring MICHIGAN'S Work Book C, showing convertible MICHIGAN Mobile CRANES in action. Write for it today!



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BENTON HARBOR MICHIGAN

ASPHALT

for

HIGHWAY WIDENING AND MAINTENANCE



As an emergency measure, highway widening can provide adequate capacity for handling traffic flow increased by defense activity. This saves the delay and expense of constructing new roads which may or may not be required in normal times.

Asphalt construction offers the fastest and simplest method of getting results. Not only can it use local aggregates, but Asphalt can be laid with little interference to traffic.

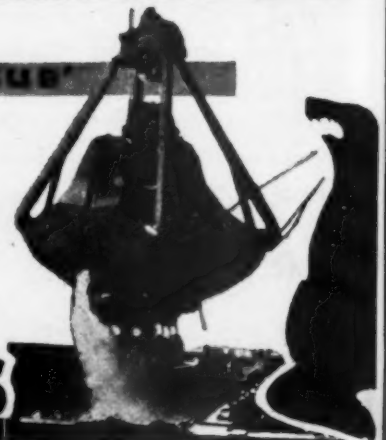
Wherever Standard Oil Asphalt products are sold, there is an Asphalt representative who can give you full information about these and other uses of Asphalt. Write . . .

STANDARD OIL COMPANY (Indiana)
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LIKE submarines that cruise beneath the surface, Owen Dredging Buckets embody special and highly efficient features to protect against the uncommon difficulties encountered in this severe service . . . special protection against water, sand, grit, etc.

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OWEN BUCKETS
A MOUTHFUL AT EVERY BITE

ALCAN HIGHWAY

... drained with LAMINATED INTERLOCKING *Creosoted* WOOD CULVERTS

Many hundreds of these culverts were used on the great Alaskan (Alcan) Highway. This largest single road building project ever undertaken used these culverts because of their strength, durability, and simplicity in installation. These were used in various sizes for drainage needs up to bridge capacities.

LAMINEX

—the ENGINEERED *Permanent*
DRAINAGE PRODUCT

Developed long before the war, Laminex was engineered for STRENGTH and PERMANENCY . . . and not as a temporary expedient. Being engineered, it has a definite computable strength. When installed, one inseparable unified conduit is formed. Made of pressure creosoted wood, it does not rot, rust, corrode, or crack or crumble—a 50 year permanent acid resistant conduit.

Send for
Specifications

Ask for
Bulletin 200-C

The
Laminated
Interlocking
Construction

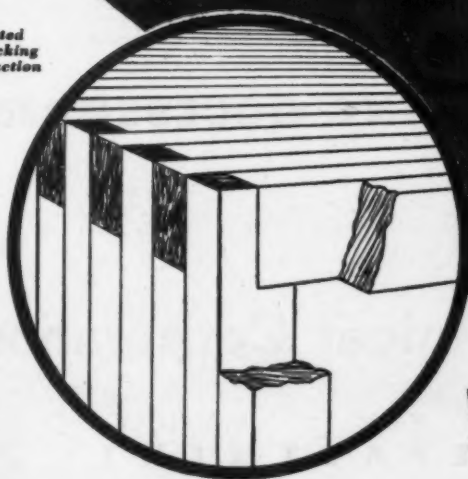


Illustration shows a cross section
view of the Laminex conduit.

Wheeler Lumber Bridge & Supply Co.
Hubbell Bldg. Des Moines, Iowa



*Maintenance
starts with
the Shot*

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AMERICAN
CYANAMID & CHEMICAL CORPORATION
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EXPLOSIVES

**Correct blasting will
minimize maintenance**
right down the line

BREAKING rock or other material down to the right sizes—avoiding big lumps as well as fines—is the result of correct blasting practice. It means minimizing wear and tear on steam shovels, trucks, cars, hoists and crushers. It helps every piece of equipment work at its best, with the least maintenance cost.

AMERICAN Explosives and Blasting Supplies are made under exacting specifications in well equipped plants. Chemical control and thorough inspection insure adherence in manufacture to the methods and processes developed by our research.

Today, as never before, efficient blasting is all-important. Capable technical service men are available to assist you with your blasting problems.

- **HIGH EXPLOSIVES***
- **PERMISSIBLES**
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American Cyanamid & Chemical Corporation



A Unit of American Cyanamid Company

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ROADS AND STREETS

JANUARY, 1943, VOL. 86, NO. 1



10,000,000 TREES!

... the building of Alcan Highway

ALCAN HIGHWAY

By HAROLD J. McKEEVER

Associate Editor, Roads and Streets

1—How it was Built in a Single Year

WELL, they did it! In less than eight months they felled ten million trees and bulldozed a two-lane road *ten times as long as the Pennsylvania Turnpike*, to keep a promise that a military supply route to Alaska would be ready by winter. A path cleared 60 to 100 feet wide through nearly sixteen hundred miles of almost uninhabited forest, muskeg and mountain testifies to the difficulty of the task.

In accomplishing this feat the Corps of Engineers of the U. S. Army, supported by American and Canadian contractors under the Public Roads Administration, encountered conditions and solved problems of vital interest to road builders everywhere. To present the facts in as much detail as the military nature of the high-

way permits at this time is the purpose of this series of articles. The reader looking for tables of data and a wealth of engineering refinements will be disappointed. For on this job there was no time to do anything but push on, push on, push on, building some kind of a road—any kind of a passable road, if need be—to a schedule of daily mileage without precedent.

Like the legendary contractor who said, "I don't know about any plans, but that's your bridge," army engineer battalions built most of the road without blueprints; these were drawn afterwards as a preliminary to progressive straightening, widening, improving and later relocating portions to save hills and distance.

That there was time to bring so

many miles of the first cut-through to a fairly high average standard and give almost the entire length a surface of gravel or stone, makes the year's accomplishment all the more remarkable. As it stood early in December when winter had set in and Alaska-bound freight began rolling, some northern portions were still partly in the raw, and many serious maintenance problems remained unsolved. Yet with this qualification, there she stood, a well graded and drained road, at least 24 feet wide much of the distance, affording two-way travel for the Army's big freighters. A truly great highway achievement and one unparalleled, at least on this side of the world, for speed and resourcefulness.

Traverses Little-Known Region

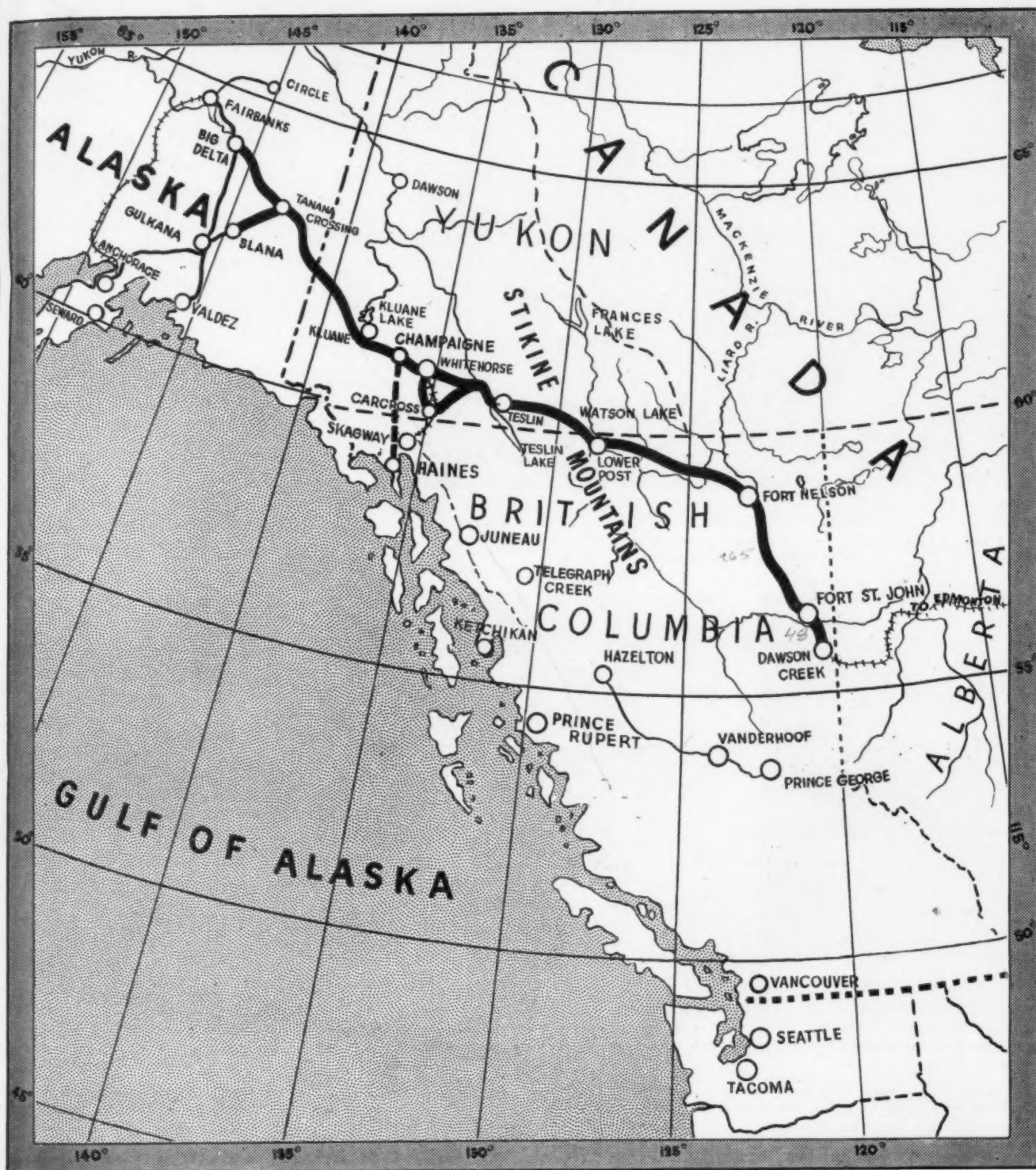
Contrary to the general impression, Alcan is more an east-west than a north-south highway. Its path and connections are as follows (mileages approximate):

1. It begins at Dawson Creek, British Columbia, at the end of the Northern Alberta Railway, where it also connects with air lines and with a fair highway leading down to Edmonton, 595 miles southeast.

2. From Dawson Creek the road runs northwesterly along the general line of an old provincial road for about 48 miles to Fort St. John, where it leaves settled farm country and plunges into uninhabited woods. For another 265 miles north to Fort Nelson it traverses the approximate route of a winter pack trail, recently

On the following 32 pages is presented seven of a series of nine articles on Alcan Highway, gathered by Mr. McKeever during a month spent in army and civilian camps along the project. Two remaining articles, on reconnaissance and surveys and on culverts and bridges, will appear in our February issue.

This series is noteworthy in that it not only covers all phases of construction but also gives a first-hand picture of the serious early-winter problems which complicated Alcan's completion and maintenance. The author was, to our knowledge, the only editorial observer to see the winter transition and its effect on both the northern and southern sectors of the road. That he was able to include such a wealth of information was due to the generous cooperation of the War Department, The Corps of Engineers, The Public Roads Administration, and the contractors on the job. Appreciation is expressed to these organizations and the many individuals who contributed the facts which made these articles possible.—E. S. Gillette, Publisher.



★(Fig. 1) Alcan Highway was located to serve a string of military airports. The principal southern connecting link to date is the rail line to Edmonton. Not shown is a provincial road paralleling this line. Were Alcan to be superimposed on a map of the United States it would extend from Miami to Oklahoma City

improved but usable only by winter sleigh.

3. From Fort Nelson the road heads about 360 miles northwestward, reaching the end of the southern sector at Watson Lake, near Lower Post settlement, via the Liard River valley and over the continental summit.

4. From Watson Lake, the path is west and northwest for 275 miles, past Teslin Lake to Whitehorse, Yu-

kon Territory, where it connects with the White Pass and Yukon Railway from tidewater at Skagway.

5. From Whitehorse the road leads to beautiful Kluane Lake, skirts behind the St. Elias Range, bridges the White River, then crosses the Alaskan border via Tanana Crossing (Tanacross) 450 miles to a junction with the Richardson Highway at Big Delta. The last 100 miles into Fairbanks is

along this road, which has connected Fairbanks with Valdez to the south for a number of years.

The total of nearly 1600 miles includes a short connecting road to Carcross and an Alaskan branch to Slana. (See map, which also shows an additional branch recently undertaken).

The highway is designed as an important military supply route and is



Public Roads Administration photo

One tractor helping another out of quagmire caused by melting ice. Near little Atlin Lake on northern sector.



Roads and Streets

Roverud Bros. of Winona, Minnesota (under Okes Construction Company), operated this crushing plant which included the following: 100-yd. per hr. Pioneer crushing-screening plant; 2 bins; 2 Koehring Dumpsters; Invincible $\frac{3}{4}$ -yd. and Northwest 1-yd. gas shovel; LeRoi light plant; Sullivan and Gardner-Denver air hammers; portable tool and repair shop; Ford trucks with Thornton Tandem drive



U. S. Army photo

Opening up a culvert drainage outlet. Because rock work was sidestepped, relatively little blasting was used on the Alaskan Highway



U. S. Army photo

First pontoons, then ponton trestle (shown), then a timber trestle was the Army's procedure. Moving ponton equipment to advance locations was one of the most difficult and important parts of the job



U. S. Army photo

Small tractors were indispensable around the camps. Bucyrus-Erie dozer equipped International owned by Standard Salt & Cement Co.

Shovels and other heavy duty units were dismantled and flown to remote work bases to speed the start of the job

U. S. Army photo

Much of the time the freshly cleared ground was so mucky gravel had to be thrown down to let equipment through

U. S. Army photo



s and Streets p

der Okes
crushing
0-yd. per
bins; 2
d North-
Sullivan
able tool
n Tandem

ads and Streets photo

Quarrying sandstone for graded material
to surface the highly developed PRA
↓ section near Fort St. John, B.C.

About 60 miles of the first pioneer road cut was relocated
during 1942. At left above is the beginning of a 14-mile
cut-off road which saved four miles and eliminated steep
mountain grades



U. S. Army photo

spensible
rie dozer
ned by
Co.

as so mucky in carrying supplies and provisions
ment through the Army's advance locating parties



Sledges did valiant service toting supplies and
men through the early-summer "soup"

U. S. Army photos

U. S. Army photo
Dimension lumber, though strictly un-
cured, was a great help in stepping
up some bridge construction



not open to public travel. It not only links with rail and highway systems of southern Canada and the United States, but it also serves as a "ground beam" for flyers and a feeder road to several airfields in Canada which heretofore had to depend on air transport for equipment and supplies.

Pierces Wild Country

A word about the region traversed. Few people outside western Canada realize the almost complete inaccessibility of the country this road has finally pierced. It includes dense forests known only to a few trappers, some areas not even to them; interminable sub-arctic muskeg swamp, impassable except when frozen; much perpetually frozen, tundra-covered ground to the north; swift snow-fed mountain streams, numbered among western Canada's largest; precipitous mountain valleys, foothills and glacial debris in wild confusion.

Generally speaking, the only previous access was by dog sled or sled and tractor in winter, by air, or by circuitous river routes in summer.

The southern end below Fort Nelson lies in comparatively flat, densely wooded terrain. West of Fort Nelson the road rises rapidly and from there on it is nip and tuck with mountains all the way. Five summits are encountered at elevations 4212, 3410, 3295 and 3410 feet above sea level (approx. barometric readings), the highest being not far west of Fort Nelson.

Among the score of larger rivers bridged are the Peace, Cut Bank,

To build Alcan Highway, over ten thousand engineer troops lived in hastily erected tent camps along the route. Tents have now been winterized or replaced by warm insulated huts

Sikinni Chief, Muskwa, Lower and Upper Liard, Nisutlin, Teslin, Lewes, Takhini, Slims, Duke, Donjek, White, Tanana, Robertson, Johnson, Big Gerstle.

It was into this wilderness setting that a small group of engineer officers and an engineer of the Public Roads Administration stepped as they alighted from the train at the Dawson Creek rail-head on the bleak sub-zero morning of March 9. Similar advance parties came in to Whitehorse midway on the project at about the same time, and a third entry was made into Alaska. The route was broken into two Sectors, approximately seven hundred miles on the Southern and nine hundred miles on the Northern, connecting at Watson Lake, in southern Yukon.

Southern Sector

At Dawson Creek the troops staked tents, established the beginning of a huge supply base, and began a battle to get supplies and equipment and labor battalions over the steep provincial road to Fort St. John and up the crooked, narrow winter trail nearly three hundred miles to bases at Fort Nelson and points en route before the April thaw. The trail was traversed clear through to Fort Nelson by hardy truck drivers. Working in 24-hour shifts, first in "40-below" weather and later in a sea of mud, the Engineers sledged and tractored, wallowed and floundered, winched and pushed their way with stream pontons, machinery, provisions, supplies and men, knowing that by April 10 the ice would go out of the streams and the bottom out of the trail.

Trucks "dropped out of sight," yet somehow got there. A tractor was

kept at the Sikinni River to snag trucks over the "straight up" grade out of the canyon. Truck drivers still tell of the adventures of passing on one-way trails in fender-deep bog. Trail hauling continued until April 9, when a final fleet of radio cars reached Fort Nelson with a winch truck for convoy. Then the struggle abruptly ended.

But there was still the air. Large tonnages of supplies and parts and even complete dismantled machines were flown up the line—shovel booms, dismembered tractors and graders, tons of drift pins for timber bridges, to name a few items. A depot farther north received one air shipment of forty drums of gas, and parts for a large gasoline truck.

By this time the troops had begun the real task of building road. They started from the end of the provincial road near Fort St. John and followed a line which pioneer survey parties had begun to blaze. Construction battalions likewise began in both directions out of Fort Nelson.

The original plan was for the Army forces to build a "tote" road to minimum standards, perhaps 12 to 16 feet wide, over which equipment could be hauled and supply lines established for building a higher standard paralleling road with civilian contractors under the Public Roads Administration. This scheme was followed until about sixteen miles of higher type road had been completed above Fort St. John with Okes Construction Company management, when it was seen that, however desirable a "permanent" road to standard alignment and grade, a uniting of all forces on the pioneer road was vital to completion of the tremendous mileage. It was

U. S. Army photo



ROADS AND STREETS, January, 1943



Roads and Streets photo

quickly decided to make the "tote" road and the so-called "PRA road" one and the same, and the Okes outfits were scattered all along the path up to Fort Nelson, pioneering assigned stretches or widening or improving in the wake of the Army, as best use of available facilities dictated.

Meanwhile at the south, between the Dawson Creek rail terminus and Fort St. John, a group of Canadian contractors under R. Melville Smith engaged in rebuilding the provincial road to higher standards under PRA direction. Later in the year as the Canadians finished their sections they moved much of their equipment up to Fort Nelson and leap-frogged past one another to widen, straighten and surface sections of army road westward toward Watson Lake.

The Northern Sector

To the north similar drama was being enacted, often with help of trapper trails and fairly direct water routes to work bases. Advance parties came late in March through Skagway via the White Pass and Yukon Railway and began reconnaissance of the northern sector and organization of lines from a base at Whitehorse. Soon boat loads of machinery and supplies and men started pouring in. Air and land reconnaissance by both army and Public Roads Administration engineers started at once, but because of spring conditions and tardiness in arrival of equipment actual construction work didn't get into full swing until early in June.

Army construction battalions attacked the lower half of the northern sector something like this:

One outfit came in through Skagway, leaving the rails at Carcross, and began building a spur road eastward to reach the main road. It made junction at a point known as Jakes Corners, about 50 miles south

of Whitehorse, and pushed southeast.

Other troops reached a base camp site on a lake about a hundred miles southeast of Whitehorse, by means of small freight barges borrowed from the railway. Here they began working in both directions. To reach this base boats had to winch their way for miles along winding streams. As many as three heavy diesel tractors and two light tractors were carried on a single barge.

Meanwhile in the Whitehorse area another group of civilian contractors under Dowell Construction Company started building a 50-mile link immediately south from Whitehorse, following a civilian-surveyed line. And the Army began building a 280-mile stretch northwest to the White River near the Alaskan border, the longest continuous push from any single beginning point on the road.

E. W. Elliott & Company, an independent contractor, did follow-up construction and surfacing on a large mileage of Army road in Yukon Territory, along with transportation, extensive camp buildings and other work.

Progress in Alaska

All this time things were happening in Alaska. Colored troops went in through Valdez and built a 73-mile branch eastward from the Richardson Highway, from Slana through virgin country to the vicinity of Tanacross, and thence southeast across the Alaska-Yukon border. The Army forces were reinforced after the first few miles by American contractors under Lytle & Green management. This Army force with civilians following up over most of the distance pushed clear through to the historic point in Yukon, just above the White River, where the bulldozers met to forge the last link in the road.

Military trucks began rolling in December. Will scenic Alcan be a future tourist route? One of many postwar questions

A 110-mile section northwest from Tanacross to the Richardson Highway at Big Delta was pioneered under Lytle & Green Construction Co.

The last 100 miles into Fairbanks follows the Richardson Highway, which was improved considerably during the year by the Alaska Road Commission using day labor. (The southern part of the Richardson Highway into Valdez is closed in winter because of snow and ice over two summits).

So much for the general plan under which the Canada-Alaska Highway was built to its present stage. These words fail utterly to picture the hardship and toil involved; the difficulties of working "without everything," as one fellow put it. Other articles in this issue touch in more detail on various phases of the job. Yet only the men, in uniform and out, who came in the spring and saw the year through can hope to convey the whole story.

Suffice it to say by November 20, date of the historic dedication ceremony at beautiful Soldier Summit above Whitehorse, the seemingly impossible promise of getting done by winter was at the point of being met. The margin was narrow. Rough spots remained. Some bridges were temporary makeshifts. November was giving a foretaste of winter maintenance problems. But trucks soon began rolling through to Alaska.

What of 1943? The Public Roads Administration has completed surveys for relocating about half the present road and reconstructing it to permanent standards, a betterment which many believe to be vital to the movement of maximum freight tonnages over the route. The location of the contemplated new road has been approved by the military authorities, and selected management contractors this winter are scheduled to recruit as many unit contractor outfits as are needed (or can be obtained) to complete reconstruction in 1943 if the war program requires.

EDITOR'S NOTE: Alcan Highway, while widely publicized, is not the only military road project in the Northwest. Of chief interest is the completed Glenn Highway which connects Anchorage on the Alaskan coast with the Richardson Highway via Palmer.

2-Alcan Roadway Specifications

Original "specs" called for a 16-ft. tote road, 30-ft. permanent road. Most of present road is 22 to 24 ft. wide

WITH such a venture into the unknown as the Canada-Alaska highway, it was seen that the usual ironclad specifications would be of little value other than as a guide. And as for plan sheets, it soon developed that there simply wouldn't be any until after the pioneer road was built.

But some kind of tentative standards were needed, and at the outset the Chief of Engineers issued brief specifications for the pioneer road and general conduct of the work. More a working philosophy than a specification, this terse document said, "*The pioneer road will be pushed to completion with all speed within the physical capacity of the troops.*" This directive further set forth the prime object: to get through to a standard which would assure an adequate supply line to Alaska by winter. Further developments were to be undertaken only when and if time was available and the available troops could not be used to push forward.

Original basic limitations for the pioneer road included these items:

- Clearing—32 ft. wide, maximum.
- Grade—10% maximum.
- Curves—50 ft. minimum radius.
- Width of surface—12 ft. minimum.
- Shoulders—3 ft. minimum.
- Ditch depth—2 ft. minimum.
- Crown 1 in. per ft., maximum.
- Bridges—one-way; H-15 loading.

It was seen that these figures often could serve only as a guide, and that any limitation might have to be set aside in exceptional situations. On the other hand, 16-ft. minimum width to facilitate passing of trucks, and 6-ft. shoulders, were recognized as highly desirable. This statement also was included: "Adequate drainage is

of utmost importance and must be emphasized at all times."

Original "Specs" for Permanent Road

Again as a tentative guide, early specifications and work instructions for the intended 1942 permanent road were issued by the Army. These basically followed the Public Roads Administration's "Specifications for Construction of Roads and Bridges in National Forests and National Parks, 1941." The permanent road was projected as one with a two-lane standard cross-section, with width confined to 20 to 22 ft. between shoulder edges where necessary to expedite construction. Surfacing was to be from local material sources, with bridges of local timber to H-15 loading.

Bridges were to have a 12-ft. clear roadway. Trestles under 100 ft. in length and trusses under 60 ft. to have a 24-ft. roadway. H-20 was indicated for future bridge development. Use of local timber was seen to be the only expedient in providing culverts.

Grades were not to exceed 10% maximum, and curves were limited to 20 degrees blind and 24 degrees with good sight on mountain roads. Final word on location and details rested with the Army sector commander since the military mission required troops to push through regardless of desirable specifications. To this end it was provided that contracts were to be so worded that civilian contractors would relinquish work without damage to civil rights, if emergency required the Army to aid in speeding completion of any section. Close cooperation with Public Roads Administration engineers

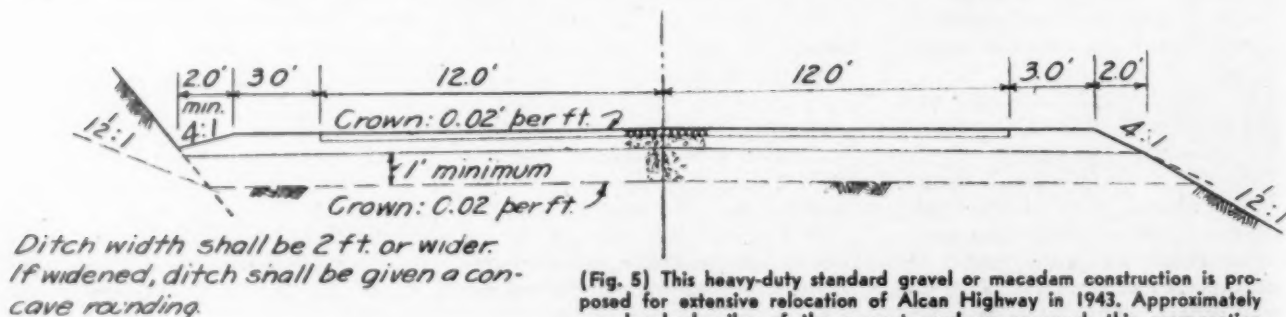
was also provided for in these instructions.

Today it is not possible to give a complete, definite picture of the present Army road's grades, curvature, etc. A small mileage of PRA-designed roadway is to 30 or 36-ft. "standard." Hundreds of miles of army-built, civilian-improved road were still in a state of progressive betterment as winter closed down, with scores of work units along the line busy making the greatest possible improvement with available equipment and materials. And all winter, improvement will continue in preparation for spring. However, hundreds of miles of the road today is a full 24 ft. wide, shoulder to shoulder. Grades over 15% are relatively few, and large stretches have no grades steeper than 10, 7 or even 5%.

PRA Standards for 1943 Work

The highway as being planned for extensive reconstruction in 1943 will have 3-deg. maximum curves in light construction; 16-deg. blind and 19-deg. open in heavy construction, with curves over 1 deg. spiralled. As ruling grade standards, locating parties have been given 5% prevailing, 6% maximum, 7% on short sections. Roadway is to be 30 ft. shoulder to shoulder in heavy construction, 36 ft. in light. This is approximately the "specs" for the highest type section completed during 1942 near Fort St. John and in the Whitehorse sector.

The 1943 road is planned to have a 12-in. minimum base covering of pit-run gravel or crushed stone, plus 8 inches of 2-in. maximum graded material and 4 inches of 1-in. graded topping material, rolled and compacted.





U. S. Army photo

A scene in the wake of the clearing crew

3—Clearing, Grading, Follow-up

Initial clearing and grading, done with tremendous speed and energy, were followed by progressive widening, straightening and graveling throughout the year

The Army's Road; Initial Construction

HERE the bulldozer was king. Methods varied according to conditions, equipment on hand and the battalion doing the work, but when a certain tractor skinner said, "We just walk 'em down, shove 'em aside and let 'em lay," he covered a good part of any description of the Army's streamlined methods.

Along most of the route trees grow thicker than "hair on a dog's back"—probably from 5,000 to 30,000 trees per mile of 100-foot clearing, but nobody ever counted them. Few trees exceeded 20 inches in diameter. Most are under 12 inches, and on some sections, particularly in Alaska, most are under 9 inches. Spruce predominates, with scattered pine and cedar and areas of muskeg undergrowth.

"Prairie" Construction

In flat ground the following general procedure was used. Although work was usually done by three separate

crews, the time-honored distinction between clearing, grubbing and grading tended to disappear; it was all part of one fast-moving operation which took virgin timber and left a 24-ft roadway in a 60 to 100-ft. clearing, complete with culverts, ditches, outlets and some grading.

CLEARING. A typical clearing outfit consisted of from 6 to 20 heavy diesel tractors, all with dozers and some with winches for helping each other out of difficulties. A common procedure was for one or more tractors to push forward along the centerline marked by red rags on trees, making a dozer-wide path far enough ahead to let the rest of the tractors string in and start side-casting at right angles. Humus and debris were scraped off along with trees and roots. Each tractor would clear perhaps a hundred feet of road per day in fair going.

Practically all trees were pushed over. In level country the only axe work for miles at a stretch was that

necessary to cut logs for culverts, corduroy or camp structures. The high percentage of "push-overs" among trees in this region is due to the poor soil and cold climate which limit root growth. Few trees have tap roots of any size. Side roots grow near the surface, where they can be cut clean with the dozer blade, after which the operator gets under the tree or lifts his blade and pushes it over.

Under favorable conditions the tractor literally scraped the trees away to the clearing edge like match sticks and left them piled at all angles. In wet ground the job was slowed up of course. The first cut might be fine, but on the second trip the tractor would cut through the moss covering and drop into the soup.

About 500-ft. work sections were commonly used in heavy timber, extending to perhaps 1000 ft. at times in lighter timber. Often there was no definite work section but just one progressive operation, with successive



P R A photo

(1) Advance clearing tractors walked down dense growths of trees to open a dozer-wide path for the grading crew. Contractor here is W. C. Thompson, Santa Cruz, Calif. (under Dowell)



U. S. Army photo

(2) Next came fleets of dozers which widened the pioneer cut by side-casting trees, roots and humus to the clearing edges. This is a Caterpillar diesel with LeTourneau angled dozer

Building the Road ... Step by Step Photo

(3) Preliminary grading crew roughed out the roadways with dozers, motor graders or pull-type blades

(4) Culverts were built and covered, drainage outlets cleared, and gravel thrown down to get supply trucks through

(5) For the finished grading, tractor-scraper was the standard unit

(6) Gravel from roadside pits was placed as part of extensive follow-up improvements continuing throughout the year



crews getting out in front. Care was taken not to string out over too much difficult ground, but to maintain a balance between clearing and grading work.

Clearing a reasonable distance ahead served an important purpose however: it let sun in and helped dry out the ground, often enough to make grading appreciably easier by late afternoon. Beginning with the first pioneer cut the job was also complicated by the necessity of letting supply and ponton trucks get by.

In Alaska and the Yukon pioneering was often impeded by the difficulty of finding ground that was not underlain by hidden "blue ice." Tractors would run around through the woods, pushing down trees as they went, to locate and uncover solid ground. On some Alaskan stretches roadside clearing was done, but stumps and most of the humus covering were left in place to insulate the frozen subgrade against melting next summer. (See further discussion, page 49). Much corduroy was laid over frozen swamp late in the fall, but on warmer summer days it was necessary to haul in gravel or dry earth and doze it across swampy areas to get the tractors through to lay corduroy. "It was a contest to see if the tractor could get through, turn around and get back," said a Lytle & Green man. "It would often mire down in turning."

Cleaning up and burning? The Army's decision was to leave that for later, if ever. There wasn't time. And burning of trees presents a serious problem because fire gets down in the muskeg and often can never be completely extinguished.

PRELIMINARY GRADING. To facilitate passage of supply trucks the clearing crew was quickly followed by a heavy motor grader or tractor and blade, which went up once and came back, blading to the center to smooth a road. At this point gravel was always thrown down if available.

Culverts Built Early

And in here pitching at various early stages came the culvert crew, hastily chopping trees and throwing together temporary log structures. (Often culvert gangs worked three or four miles ahead of the pioneer cut). Behind the pioneering crew, graders followed, covering the culverts and improving upon the initial blade cut. This crew usually left the road roughly cross-sectioned and ditched if no heavy grading was required. Make-shift drags or stoneboats, used in muddy weather in the southern sec-

tion to skid supplies and tools, helped smooth out ruts.

FINAL GRADING. The standard unit here was a heavy tractor and scraper. One, two or three units working together cut down steep grades, ditched onto the roadway, worked borrow pits, widened shoulders, built up the road across low ground, covered corduroy or did other tasks to make the best account of themselves. Scrapers were of various makes and sizes up to 15 yards in the Fort Nelson area and in some cases 18 yards in the northern sector. In fine alluvial soil cuts of almost any depth could be scooped out with ease.

Some graders were used in the final operations. Fine points of fill-making such as placement in layers and rolling were dispensed with to save time; compaction was left to the machinery and passing trucks. One-half and $\frac{3}{8}$ -yd. shovels, when available, were put in borrow pits or used for side-casting in heavy cuts.

Heavier Construction

On hillside locations the procedure was the same except that many trees beyond the excavation had to be axed. The clearing dozer made part of the shelf on the first pass, and widened on successive passes, as in routine practice. Most hill work in the southern sector was in soft silt or workable clay which could be moved with ease.

Rock cuts likewise involved no novel methods. Farther north, shovels up to $1\frac{1}{4}$ -yd. were operated, with plenty of drilling and blasting in a few areas. But most rock difficulties were sidestepped by skirting the outcroppings.

"Muskeg" is the first word the visitor hears along Alcan Highway. True muskeg, such as abounds in northern Ontario, is a "bottomless" swamp filled with moss and other vegetable matter in varying stages of decay and compaction. Muskeg is a by-product of poor drainage due to the dense forest covering and frozen sub-soil. Contrary to popular opinion it isn't confined to bottom land, but may be found on any ledge or valley shelf.

In general the muskeg along this road was not as fearsome as anticipated. Much turned out to be only 2 to 6 feet deep and soon stopped settling under the gravel and corduroy. But there was plenty of soft going all summer! The Army's expedient was to build around most of the muskeg. Locators, warned by the tell-tale presence of spruce, tamarac or bush, did their best to sidestep without too much meandering of line.

But innumerable stretches still had to be crossed. One answer was to fill with gravel, if available, as a first try. But more often it was corduroy, cut from nearest trees. About 100 miles of corduroy was used on the present road, in sections ranging from a few feet to six thousand feet. One 35-mile stretch is intermittent corduroy all the way, with two, three and as high as eight sandwich layers of logs. Six to 8-in. logs were used, separated with six inches or more of gravel and given a foot of covering. Width was 18 to 24 ft.

Minor Relocation by the Army

Occasionally along the present highway one sees a blind cut into the trees, where a dozer had backed away from poor ground for a new try. Also a number of minor relocations such as passage over or through a hill instead of around, or vice versa; or obvious short-cuts to improve the line made by equipment that could not be used at the moment to push forward. In some instances cut-offs saved crossings with meandering creeks.

All told, including several major cut-offs, about 60 miles of the original Army road has been relocated to date, including many short pieces without surveys.

The road today is not a "modern" highway by strict professional standards. But it is a surprisingly good road considering the construction pace and difficulties.

Civilian Follow-up on Army Road

The road as first holed through the woods by the regiments varied greatly in width and grade as well as line. The follow-work assigned to civilian contractors and continued into the winter is summarized briefly:

WIDENING AND IMPROVING GRADE. Much Army grade was a full 24 ft. wide, but just as often in heavy construction it was expedient to leave only a 16 ft. width. Obviously the first task of the contractors was to widen out to 24 ft. in prairie and as much as readily possible on hillsides. A few scattered sections were shouldered out to 27 to 30 ft. Grades were cut down to eliminate danger spots as opportunity permitted, using any equipment available.

SURFACING. The big follow-up job was graveling. Gravel pits were opened all along the contract sections, and during the fall months hundreds of miles of road were surfaced and widened by combined Army and civil-



P R A photo

A straight, well graveled section. Most of the Alcan, however, follows a meandering line in an effort to sidestep muskeg or rock excavation

lian effort. In one area visited, for example, surfacing was being handled by the Army unit that built the road, as part of a program of combined betterment and maintenance outlined by the company commander. On other stretches contractors were assigned to do agreed surfacing and widening, with plenty of leeway for using judgment.

Thickness of graveling has varied from a thin blade-spread up to many feet; 18 in. is a probable average. Much roadway over corduroy or low spots was given two to three feet of gravel where material was close by, in an effort to fortify it against the spring thaw and possibly save reconstruction.

In the southern sector gravel is not everywhere plentiful. One case of hauling 18 miles was noted. Other parts of the road have been well served, either with gravel or with a soft sandstone that packs down under construction traffic but is not likely to wear well.

Much Gravel in North

On the northern sector gravel was found everywhere. The big problem was to keep out stones over 3 in. and to make satisfactory surface material from rock excavation. This winter an effort is being made to locate a primary crusher in the region. This unit, and more like it, will be needed to obliterate the ravages of winter and spring and help with contemplated 1943 construction.

Some pits have been worked by small shovels. Several dozer-ramp pits were in use. Sledding of material directly on the road from frequent pits was on expedient to meet equip-

ment shortage. Opening some pits involved a major clearing job.

MAJOR RELOCATIONS. West of Fort Nelson a 14-mile relocation is in progress which will save four miles, reduce grades from 18% down to 7% and miss bad ground. Another major relocation is a 14.5-mile cut-off north of Whitehorse now 60% complete, and a third 50 miles in length has been completed to pioneer road standards south of Whitehorse. These jobs are expected to be incorporated in the relocated permanent road planned for 1943 construction.

Initial Construction by Contract

ABOVE FORT ST. JOHN. At the start of the 1942 season, before expediency required a change in plans, a short stretch of 30-ft. standard road was built by the Okes Construction Company northward from Fort St. John, as noted elsewhere. Here timber was very heavy—sometimes a "solid wall" of trees up to 18 inches in diameter. Clearing was done in accordance with Western United States practice, in that the trees were cut, piled and burned, and stumps grubbed or stooled out. Many trees had to be axed because of delay in arrival of heavy tractors. Grading was to set stakes, and spreading of selected base gravel and graded top materials followed standard specifications. Fills were rolled in layers.

Considerable muskeg was removed with draglines, often to a depth of several feet, and backfilled with selected material. Culverts were of standard treated timber pipe without headwalls. Every available type of heavy equipment was represented,

including some elevating graders.

DAWSON CREEK TO ST. JOHN. During the year the R. M. Smith Company's unit contractors completed the 48-mile relocation of the old provincial road between these towns, to a design approaching PRA "standard." This section connects with the above project.

Aggregate plants figured importantly on both sections of permanent roadway. R. Melville Smith operated seven semi-portable crushing and screening plants, including several primary crushers. Okes ran several aggregate plants in addition to roadside pits.

Fast Civilian Job

SOUTH OF WHITEHORSE. Dowell Construction Company's unit contractors built this heavily graded portion 50 miles in length to a 24-ft. width in 8 weeks. Like other managers, Dowell assigned a definite work section to each contractor. The small amount of rock encountered was sidestepped, making minor twists in an otherwise remarkably straight and steady alignment. Earth fills and cuts up to 30 ft. were built entirely with dozers and scrapers, making grade 18 ft. wide with the initial push. The few shovels available were used in material pits to load pit-run gravel for a low standard surfacing. To expedite completion, some gravel was also placed by scrapers. About 25 miles of this stretch is improved to high modern roadway standards.

The speed of this job was made possible by building simultaneously from each end, and both ways from the middle. To get supplies and machinery down to the southern end, Dowell's men resurrected an old stern-wheeler river boat on a nearby lake. Equipment was walked or hauled several miles to the lake, then taken along streams to outlying camps.

Cleaning up and burning trees and stumps continued all year on this section which is a fine-riding piece of road.

IN ALASKA. Lytle & Green's 110-mile section south of Big Delta presented few unusual difficulties. No shovels were used. Twelve-yard scrapers carried the load on grading, with a few up to 18 yd. The ten unit contractors had almost identical work sections and outfits, a typical crew having 3 scrapers, 1 dozer, one heavy push tractor to help load scrapers, 1 motor grader and several pull graders. "Leap-frogging" again describes their method of progression.

The prevailing width here is 20 ft.

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with clearing at 60 ft. Heavy cutting was avoided by sidestepping cut banks, since prevalence of permanently frozen boggy ground made it disastrous to uncover and expose frost to the melting sun. Rock cuts were avoided because of lack of compressors.

Temporary bridges were built by four contractors, each having one small dragline and pile driver.

Miscellaneous Notes

BLASTING. Very little blasting was done for the present road because of the policy to sidestep rock cuts where possible. However, up north of Whitehorse in December some drilling and shooting was in progress in ledge work, and it is expected that this job will continue all winter using 10-cap detonators for small and 40-50-cap for large shots. Some blasting to get into frozen gravel pits may be in the cards; likewise for removal of ice formations over the road.

One interesting piece of rock removal observed involved coyote holing into a cliff along a lake for a shoreline road, where 30,000 lb. of 50% and 60% powder was to be used to send down a face area 100 ft. high by 100 ft. long. This job, at Summit Lake above Fort Nelson, was done by Campbell Construction Company, under R. Melville Smith.

SAW MILLS. A saw mill was set up by the Army near Fort Nelson early in the season to cut timber for camp building and bridges. Several mills along the road have been operated by contractors. Their usefulness is limited by the fact that 10x10 or 12x12 is the largest lumber obtainable from local timber, with trees for these sizes often very scarce.

SOILS. No extensive engineering study of the soils and materials of



Roads and Streets photo

At the left is the Army's pioneer road; at right, a stretch of civilian-built permanent relocation

the region along the road has been made. Much of the soil in the southern end is a gumbo clay, perhaps A-7, which swells when wet and has little load bearing value. In Yukon there are increasing stretches of very fine powdery alluvial silt (A-4) which raised so much dust under traffic last summer that trucks had to run with lights all day. A recent analysis showed practically all passing 200-mesh. This soil, too, is bad when wet, will probably frost heave, but is classed as a fairly good binder. Elsewhere all bets are off, as the valleys

of this region are glacial, with delta land, talus from the slopes and occasional areas of pumice adding to the complexity of the soil situation.

COMMUNICATIONS. Throughout the year a major difficulty was the lack of communication facilities. The Army had radio cars at frequent base camps but field work was often miles away from message centers. Contractor camps, sometimes strung out long distances, suffered a similar handicap. (It is anticipated that pole lines will be largely completed during the winter by tripoding poles.)



Roads and Streets photo

Topping and widening Alcan Highway with gravel was continued well into the winter. Shown is an Allis-Chalmers Model "L" tractor with LeTourneau bulldozer and Caterpillar grader

Another gravel pit up in the Yukon



4—Maintenance and Winter Problems

Snow, road "glaciers," crazy acting rivers, "chinooks" complicate the winter maintenance problem on Alcan

MAINTENANCE of sixteen hundred miles of gravel and stone road is a man-sized job anywhere. When you add to the picture a sub-arctic climate, a new raw subgrade, a surface in varying stages of placement, and a concentrated traffic of heavy trucks negotiating steep hills and sharp curves, you begin to see the maintenance problem on this highway.

Maintenance through the past autumn was not a separate function but rather a part of the progressive betterment program. Army and civilians each had sections under their care. This winter the Army has set up road maintenance as a separate function, to be carried out by Army and civilians under military direction as part of a broad winter-work program, which includes:

Construction of camp buildings to get soldiers and civilian workers in out of the cold.

Major overhauling and repair of equipment.

Construction work on bridges—stockpiling of piles, lumber, etc., by several sawmills; and substructure or trestle work on several per-

manent bridges as weather permits.

Roadway maintenance and allied work.

Only the fourth item will be discussed here. A big effort was made during November to get as much as possible of the road topped out and bladed smooth before the freeze-up. In nearly two thousand miles of travel over the road during the freeze-up period, the writer encountered only a few miles that had been caught with deep ruts. Most of the way a satisfactory winter surface condition had been established, and graders were busy trying to keep it that way. The aim was to maintain a few inches of compacted snow on level road, and keep some exposed gravel on bad hills and turns.

A typical patrol section of the Army is about 45 to 50 miles. Late in the fall each unit commander made a survey, staked out gravel pits and undertook an approved list of duties that would make the best use of the equipment at his disposal. Perhaps ten men will be on maintenance, working two motor graders, and a snow plow if in a heavy snow belt. Additional troops are available to

help in case of any emergency, such as a sudden icing-up of road which would necessitate spreading a lot of material. Gravel will be stockpiled by steep hills and bridges.

In preparation for winter, much roadway was flattened or crown reduced, and ditches bladed full to increase safety. Gravel or snow was windrowed on shoulders to define the edges, and railing was added to many small bridges or the guard rails raised by adding another course of logs or timbers. Culvert outlets were added where this important detail had been skipped in construction, or cleaned and enlarged.

Larger bridges are being guarded during winter by small troop detachments, to act quickly in the event of ice damage to trestle bents, or other emergency.

Signs and Markers

Under maintenance possibly might come the job, now well completed, of marking the road with warning and speed-limit signs. Speeds are limited to 25 mph. in some sections, and 30 to 20 mph. respectively for passenger vehicles and trucks in others. Alcan already has speed cops! All bridges have been posted, too, with load-limit,

Gravel spreading was also done by motor graders, as part of maintenance





Alcan is well marked with warning signs. Mile posts were installed immediately to help in reporting work locations and in keeping contract costs on each measured mile

"one-way" or other signs. Signs are of rectangular wood construction, lettered white or black on a bright-colored background visible against the snow. Mile-posts are nearly all installed, as are mile-markers at bridges—an important detail which permits accurate reporting of accidents, location of work destinations, etc. Up here you can't say, "It's just south of Smith's barn, across from a red school house."

Snow Removal

Fortunately the Canada-Alaska Highway traverses a light snow belt—one of the factors considered in its location. Government snow records over an 11-year period together with data from local people, indicate that the total fall ranges from 18 in. to 4 ft., with more in a few mountain passes. Also, wind and drifting are not anticipated to be a great problem. Still and all, the Army made preparations. Beginning late last summer it succeeded in rounding up snow equipment of every type and size, including a few rotaries. The plows began arriving late in November. Many came from mid-west state and county garages.

Some bulldozers are being kept on hand for snow removal; a few are equipped with 5-ft. blade extensions. They will be used to move snow slides or packed snow.

Snow marker poles are in place at intervals of a hundred feet or more through the areas of heavier snow fall. Most small bridges and large culverts are pole-marked.

Old Man Winter

Four big winter problems in addition to surface maintenance and snow removal can be put down.

ICE OVER THE ROAD. The first and most worrisome is the accumulation of ice over the road. Locally called "glaciers," this condition is a familiar problem in Mt. Ranier National Park and on certain other high-altitude roads in the western U. S. Seepage areas and springs on the high side of the road or in banks and gullies often continue to flow after starting to freeze. Ground water oozes out over ice surfaces already formed, freezes, and builds up an ice formation that gradually (or quickly) fans out across the roadway. Culverts are engulfed. Shallow fords become flooded and widen progressively, yet have soft crusts or pot-holes in early win-



Roads and Streets photos

Early-winter gravel pit operations had to keep going night and day to stay ahead of frost

Gravel trucks in early winter had to be dumped quickly before the material froze





Roads and Streets photos

Ice from half-frozen springs and hillside drainage was a serious early-winter problem over many miles of road. Rooter plows, hand picks and other experimental means were used to keep this condition in hand

ter that let vehicles down into the slush. Most hazardous of all, ice builds up on mountain road shelves until the surface slopes perilously toward the outer shoulder, finally stopping traffic until the condition is corrected.

How to solve the ice question was the No. 1 early-winter maintenance problem on many parts of the northern sector. Among the many experiments being discussed or tried at the time of the writer's visit are these:

1. Chip into and break up the ice by means of a heavy rooter, pulled by two tractors in tandem—a small tractor on the ice to hold the draw-bar steady and a heavy tractor off

the ice exerting traction.

2. Blast ice loose with a half stick or so.

3. Trench ruts or deep grooves which will serve to guide traffic safely through.

4. Cover the ice with corduroy or bridge it with low, silled-up timber floors.

It was hoped that many of these "glaciers" would quit growing after a period of cold weather, but seepage of this kind is known to flow and accumulate ice all winter.

BRIDGE MAINTENANCE. Second, and a whole subject in itself, is the dangerous, unpredictable behavior of sub-

arctic rivers when they begin to freeze. The shallow one, and some say the deeper ones, too, freeze from the bottom as well as the top. Shallower streams have a "sandwich" of water which is forced out and around the normal channel, or over the frozen surface. Either way spells trouble for culverts and bridges.

Perhaps the best theory as to why the bottom of a stream often begins to freeze first is that the ground beneath acts as a refrigerator; in some instances the subsoil is perpetually frozen from a few feet to 50 feet down; in others, its temperature drops below freezing before that of the stream. The fact that bottom flow is stillest may have a bearing.

The White, one of the last rivers to be spanned in completing the highway, demonstrated the trouble-making proclivities of this phenomenon on a large scale.

Early-winter surface ice also made trouble. Temporary trestles over several streams were badly damaged by ice pressure.

Skewed Boom Diverts Ice

One bridge is protected by an adaptation of a system developed by the White Pass & Yukon Railway to protect a timber dam from fall and spring ice. The ice above the dam is controlled by 3 log booms stretched across the river at approximately 1000 ft. above the structure. The Alcan structure in question is similarly protected by booms located about 3 miles upstream at a point where the channel is 600 ft. wide. The important feature is that the booms are anchored at an angle of 45 degrees to the channel to force the floating ice to the shore where it will spend its force without causing damage. At periods when the volume of ice is large, ice jams are formed that minimize further movement of ice down the river. (See Fig. 8 on page 50.)

MACHINERY OPERATION. A third winter maintenance problem is the effect of extreme cold on machinery operation. Spindles of truck wheels crystallize and snap off and tractor treads split. Hydraulic apparatus sticks. Lubrication fails. Fuel lines clog. Machines run at low efficiency while having harder tasks to do. This problem, familiar in the northern states, is greatly accentuated when temperatures hover night after night at 30 to 40 "below."

Winter slows up digging in all but solid rock. One ramp gravel pit, which had been worked with a small dozer, delivered only half as much gravel per hour with a heavy dozer after



P R A photo

Permanent ground ice uncovered in August in Alaska. Best expedient was to leave insulating cover in place when clearing for the road

frost started to accumulate. Gravel pit work has to continue nearly 24 hours a day, once extreme cold sets in. Shovels in gravel must waste large chunks of frozen stuff to get through the crust.

And the motors of innumerable tractors, shovels, graders and other units are left idling all night because of necessity to stand out; cold weather starting is a problem all along the line.

"CHINOOKS." This is the name for a warm wind that sweeps east over the mountains from the Japan Current one or more times each winter and gives this region a spell of false spring. This weather phenomenon commonly occurs all the way from southern Al-

berta into the Yukon. And when it hits, it may melt snow banks over night. What it will do to the carefully winterized highway surfaces of the highway, is the fourth big winter question. It is hoped that the road can be preserved as a "winter road" until the April thaw.

A Question for 1943

The spring thaw is expected to cause a shut-down of much of the road for repairs. But these repairs can be made. The big concern is over what will happen next spring and summer where the road crosses ground ice. Many miles of such present roadbed is involved in Yukon and Alaska.

Roads and Streets photos

This condition, variously termed "frozen ground," "blue ice," "glacier" or "ice lenses," occurs in areas from a few feet in extent to a mile or more. The writer traversed a 16-mile stretch of highway in Yukon that was built over intermittent areas of ground ice all the way. Ground ice is almost impossible to detect by the locating engineer, as it is hidden under a foot or more of moss and humus covering, and is usually overlain with tree stands of various density as well. The pioneering bulldozer will clear down a few inches, only to strike ice substance that varies from frozen mud to clear blue ice which can be chipped into white crystals with a pick. With a thick insulative covering this ice stays perpetually frozen. But when uncovered, as the roadbuilders found to their near-disaster at times, the sun or a warm rain will melt ground ice alarmingly and render ice-filled ground extremely unstable.*

The cause or origin of this ice is the subject of many an argument around the camp stoves. Some say that it is the remnants of ancient glaciers; masses in the shape of a giant lense (see Fig. 6), whence the name "ice lense," cling to the sides of mountain valleys, permanently buried under the forest covering. Areas rising a thousand feet in elevation and extending a mile along the valley side have been reported.

* Frozen ground and ice in Alaska are covered with "tundra," which is a layer of moss and other vegetation. "Where tundra is thickest, you'll find ice," is the advice of old timers. The low areas abound in what is called "niggerhead" swamp—frozen marshy ground or moss-covered ice dotted with 2-foot-high moss hummocks with grass growing out of them. Again, as a minor variation in word-meaning, around Juneau the word "tundra" means a springy marsh—vegetation covered bog, where in summer trucks suddenly break through and drop "out of sight."

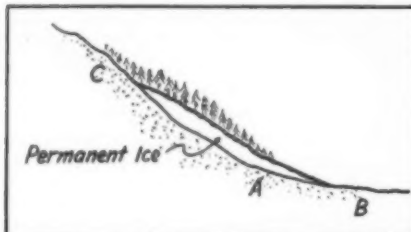
(Left) Installing camp sewer with Barber-Greene ditcher. (Right) Power equipment speeded the job of winterizing the Army's maintenance and transportation camps. The Cletac is drawing a light tote truck





Roads and Streets photo

Light plants did yeoman service on Alcan Highway. This is a Le Roi, serving a pile driving operation



(Fig. 6) How "ice lenses" plagued the locators along hillsides in Alaska and Yukon. A road shelf cut at A would expose buried ice to the sun and invite quick disaster. Alternate location B or C preferred

Note how snow is windrowed along the outer shoulder as a safety aid. This is on a long 5% mountain grade west of Fort Nelson, brought to a good winter condition by frequent blading just before the first snow and freeze

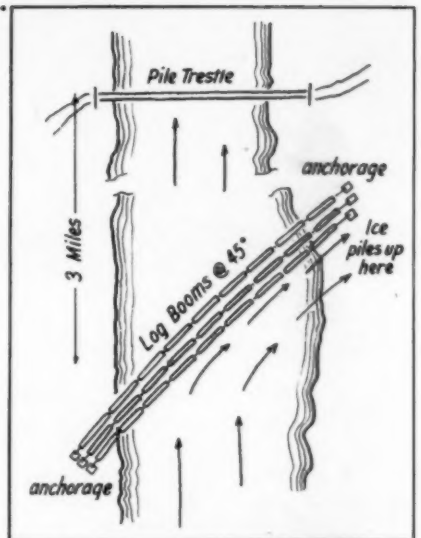


ROADS AND STREETS, January, 1943

erators often had a merry time wallowing along as melting started. Chewed-up roadside strips fifty feet wide testify to the effort of the skimmers to get back and forth.

Ice causes trouble particularly when cut into for hillside shelf construction. The solution was to build along ridges, or around the toe of hills.

In the late fall rush to finish the road, some ice was crossed in the knowledge that it would stay frozen until spring when the road could be relocated. The big hope is that, with a heavy layer of road gravel to insulate it, much ice footing will stay frozen next summer and prove satisfactory as a subgrade.



(Fig. 8) How log booms were used to protect one bridge by shunting ice to a flat beach and causing jam to form upstream

Roads and Streets photo



U. S. Army photo

Husky troopers carrying floor girder for ponton trestle

5—The Builders of Alcan

Some notes on the 16,000 engineer troops and civilian workers who toiled on this job

FIRST credit for completing the Canada-Alaska road in a single season goes to the enlisted men of the U. S. Army. Using muscle, brain and spirit as though at an actual war front, they slogged in mire, battled insects and worked double 10- and 11-hour shifts seven days a week through the long summer daylight, living the roughest kind of camp life far from home, mail, radios or other entertainment. Not a few won hero citations.

And all are proud of an accomplishment that is only now beginning to be seen in its true magnitude by the American public. This winter, incidentally, richly earned furloughs are being enjoyed, while most of the troops on the job are now housed in warm barracks or prefabricated huts.

A total of about 10,000 troops, mostly engineers but including some Quartermaster and other service troops, were employed in building the Alcan Road. Engineer units in the North were the 18th, 93rd, 97th and 340th Engineer Regiments; Company D of 29th Engineer Topographic Battalion; 73rd Engineer Light Ponton Company; 428th Engineer Dump Truck Company.

In the southern sector there were

the 35th, 95th and 341st Engineer Regiments, with 74th Engineer Light Ponton Company and Co. A of 648th Engineer Topographic Battalion.

A Remarkable Organization Job

Alcan project was set in motion by Brig. General C. L. Sturdevant, Assistant Chief of Engineers, under whose direction the job of organizing various Army units and supply lines was done. Construction of the road was a Corps of Engineers project, under the Chief of Engineers, E. Reybold. The work started with Col. (later Brig. General) W. M. Hoge in charge of the entire road, the southern sector later being put in charge of then Col. James A. O'Connor because lack of communications necessitated decentralization. It was completed and winter maintenance began under Brig. Gen. O'Connor of the Northwest Service Command, with Col. K. B. Bush, chief of staff. Col. John W. Wheeler is officer in charge of Alcan Highway. Colonels E. G. Paules and R. D. Ingalls are in charge of the northern and southern sectors respectively.

The planners and officers on the job comprise a long list of top-flight military engineers as well as some two

score men recently prominent in civilian road building.

In the intricate work of preliminary organization, assembling troops, arranging for food and machinery supplies, boats, trains, planes and other transportation, General Sturdevant drew from a ripe administrative experience as a military engineer officer. A West Point graduate, he was in charge of surveys of Guam in his early days, and has served on river and other projects throughout the U. S.

Brig. General Hoge's background includes a D.S.C. from the first World War and outstanding work in the U. S. Engineer Corps on Missouri River flood control.

General O'Connor is a West Point man ('07) and World War veteran whose construction experience includes the million-cu. yd. rock tunneling of Corregidor fortifications in the Philippines and extensive public works in the U. S.

Colonel Bush, a civil engineer (Illinois '16) came to Alcan from the Adjutant General's office, after an Army career dating from service in France and lately including administrative charge of the CCC camps in Michigan, Illinois and Wisconsin.

And Col. Wheeler is a transportation executive, who had previously served as a state highway commissioner (Indiana), road contractor, and in earlier life a surveyor. Another typical officer previously was operations manager of a large Canadian paper company; a veteran logger. Many captains and lieutenants were picked for similar backgrounds.

Corps Of Engineers

"Essays"—"We will try, we will dare!"
—Motto of the Corps of Engineers

Who are the Corps of Engineers? What is its history? Where did it get the "know-how" to build Alcan Highway and myriad other large projects with such a record of speed and competence? The following timely paragraphs answer the many questions of this nature which have come from the readers of ROADS AND STREETS.—The Editors.

ALCAN HIGHWAY is part of an almost unbelievably large construction program carried out by the Corps of Engineers, which since December 1, 1941, has included the Construction Division of the U. S. Army. Of recent appropriations totaling approximately nine billion dollars, seven billion have already been converted into war construction, including access roads, barracks, camps, ordnance and war industrial plants. All construction has been finished on schedule and quarters have always been awaiting every soldier when called into service.

From Revolutionary Days

While the present Corps of Engineers was organized by Act of Congress on March 16, 1802, an excellent Corps of Engineers functioned during the Revolutionary War. It was established by resolution of Congress, March 11, 1779, and was commanded by Brigadier General Louis du Portail, a distinguished officer of the French Royal Engineers loaned to the American Government by the King of France. Other distinguished French engineers served with General Washington's army, some in the Corps itself under General du Portail and some in other units of the Army.

The services of the French engineers in America were notable, and the French influence upon American military affairs was felt long after this Revolutionary Army Corps of Engineers was disbanded in 1783. This influence was manifested in the appointment of a Frenchman to command the new Corps of Artillerists and Engineers established by President Washington in 1794. This Corps was stationed at West Point and included a military school where the French influence dominated.

Before General du Portail returned to France in 1783, he had submitted detailed plans to General Washington for the establishment of a National Military School and a Corps of Engineers. These plans, plus the

By MAJOR ROSWELL P.
ROSENGREN, C.E.

Chief, Office of Technical Information
Office of Chief of Engineers

recommendations of President Washington and General Knox, laid the ground work for the later action of Congress in establishing the present United States Military Academy and Corps of Engineers at West Point on March 16, 1802. The combining of the Academy with the Corps of Engineers in the wording of the Act caused the Academy to fall completely under the management of the Corps of Engineers until after the Civil War, when for the first time (in 1866) it was permitted that an officer other than a member of the Corps of Engineers could become superintendent of the Academy.

Although the operation of the Military Academy ceased to be an Engineer function in 1866, there has been a close relationship between the Corps and the Academy at all times. During the early years, the Corps was comprised of officers and West Point cadets only—Engineer soldiers not being provided until the emergency of the War of 1812. At that time a company of Engineers was organized for service along the Niagara frontier but was abolished after the War in 1821. Officers alone constituted the Corps of Engineers until 1846, when Company A, Engineers, was authorized by Congress and served with distinction under the command of Captain Alexander J. Swift and his lieutenants. The young Engineer officers, practically all graduates of West Point, who served throughout the Mexican War received training which later helped distinguish them as generals in either the Union or Confederate Army during the Civil War. Among them were Robert E. Lee, George G. Meade, George B. McClellan, Toussaint Beauregard, Joseph E. Johnston, and John Pope.

Helped Develop West

Officers trained in the Corps of Engineers were used during peacetime on all manner of construction incident to the development of the country. During the first half-century of our national life, the Corps was something definitely more than a military instrument. It became a unit in the development of the Nation's resources

and a prime factor in the winning of the West. One of the most important duties during that period and afterwards came under the head of topographic surveys, which were really extensive explorations, and laid the foundation for westward migration. Many of the wagon roads laid out in the early days later became approximately the roadbeds of great transcontinental railroad lines.

The services of the members of the Corps of Engineers in both the Union and Confederate Armies—both as General officers and engineer constructors—were notable in every respect.

Company A, Engineers, of Mexican War fame, developed into an Engineer Battalion during the Civil War. It was stationed at Willets Point on Lower Long Island Sound after the war. Here, in 1869, the Engineer School of Application was established—destined to grow into the present elaborate Engineer School at Fort Belvoir, Virginia. This school has become the engineering center and is called "the heart and soul of the Corps."

The magnitude of the tasks accomplished by the Corps of Engineers in France during World War I is little understood by laymen. Entire ports were built, great depots established, sawmills, quarries, and factories were set up and operated, within the boundaries of France itself—and often the Engineer units engaged in construction work near the front lines were called into combat service. As to size, the Corps advanced from 256 officers in 1916 to 11,175 officers in 1918 and from 2,200 enlisted men to 285,000 enlisted men for the same period.

Mississippi Flood Control

As indicated, the peacetime accomplishments of the Corps of Engineers have been no less notable than those during wartime. During the present century the outstanding projects, of course, have been the Panama Canal, the Mississippi Flood Control, and the great power dams. During the year from 1920 to the outbreak of the present war, a huge civilian organization was developed to handle civil construction work, in addition to military personnel assigned to the Civil Works Projects. The basic unit in this organization was the



U. S. Army Signal Corps photo
Brigadier General Clarence L. Sturdevant, Chief, Troops Division, Office of Chief of Engineers

Colonel K. B. Bush, Chief of Staff, NWSC

Pinkstaff-P R A photo

Brigadier General James A. O'Connor, commanding Northwest Service Command



Military Men *behind Alcan Highway*



Colonel E. G. Paules, commanding north sector



U. S. Army Signal Corps photo
Brigadier General William M. Hoge, Corps of Engineers



Colonel John W. Wheeler, commander of Alcan Highway



Colonel R. D. Ingalls, in command of southern sector

Major General Eugene Reybold, Chief of Engineers, U. S. Army

U. S. Army Signal Corps photo



Engineer District, of which there were approximately sixty, each in charge of a District Engineer who operated with a wide degree of latitude under the Engineer Department.

These peacetime construction activities were an excellent proving ground and training field for the Army's builders, and the nuclei thus created and available when the present emergency arose were sufficient to meet the requirements of the rapidly expanding army.

Among the thousands of engineer officers serving throughout the world today are a great many who undoubtedly will play an important role in post-war highway development. Alcan Highway and other military projects afford ideal training for their future peacetime tasks.

During the 140 years of its existence the Corps of Engineers has built up a well deserved reputation as builders and defenders of the Nation. Its French motto, "Essayons"—"We will try, we will dare!"—is a tribute to its early French instructors.



Public Roads Administration leaders conferring at Whitehorse. Thos. H. MacDonald, commissioner, and J. S. Bright, district engineer in charge of Alcan project

P R A photo

Public Roads Administration

The Public Roads Administration, Thomas H. MacDonald, Commissioner, directed civilian contract work through its regional office at Seattle, with project headquarters at Fort St. John and Whitehorse, together with field offices along the road.

J. S. Bright, district engineer at Seattle, is in charge, with N. F. McCoy, senior highway engineer, as district engineer's representative at

Whitehorse and Levant Brown, senior highway engineer, acting for the district engineer in his absence.

Supervisory personnel in Fort St. John (largely recruited from the Denver and Salt Lake City offices) include C. F. Capes, construction engineer; M. M. Flint, administrative assistant; E. E. Erhart, locating engineer; R. R. Tipton, bridge engineer; W. T. Pryor, design engineer; W. H.

Curwen, assistant locating engineer; and F. J. Dixon, W. J. Nelson and D. M. Emrich, supervising engineers.

Personnel in the Whitehorse sector (mainly from the West Coast) include F. E. Andrews, construction engineer; J. B. Reher, locating engineer; R. B. McMinn, bridge engineer; H. A. Stoddart and C. G. Polk, assistant construction engineers respectively in Yukon and Alaska; Jean Ewen, de-

Mess Call! Good food and lots of it was served in the civilian camps along the Alaskan Highway

Roads and Streets photo



sign engineer; George W. Egan, office engineer; John McGilluray, W. J. Ward and P. R. Rawls, assistant locating engineers. H. R. Davenport and Fred Hartford designed the timber bascule bridges described in a separate article planned to appear in February.

The Alaska Road Commission, Ike Taylor, director, made improvements on the Richardson Highway section of the road and is building a permanent bridge.

Contractors Include Many Well Known Firms

Working independently or mobilized under management contractors were 55 construction contractors using more than 6,000 workers, one of the largest civilian force ever to work on a single road project. The management contractors were: Okes Construction Company, St. Paul, Minnesota; R. Melville Smith Company, Ltd., Toronto, Canada; Dowell Construction Co., Seattle, Washington; and Lytle & Green Construction Company, Sioux Falls and Des Moines, Iowa.

General Construction Company, Ltd., Granville Island, Vancouver, B. C., and E. W. Elliott & Company, Seattle, served independently as contractors. The Miller Construction Co., of Edmonton, Alberta, has the contract for extensive pole line construction, with Oman and Smith, Nashville, Tenn., as subcontractor.

Management of Contract Work

All contract work on Alcan Highway Project was on a fixed-fee basis with disbursement through the Public Roads Administration which acted as engineering as well as construction supervisors subject to Army approval. Equipment was furnished by the management contractor, through its "unit" or construction contractors. All operating supplies, however—including equipment, parts and food—were purchased with PRA funds

through the contractor's central purchasing agent, each management firm acting as a combined purchasing agent, warehouse and distributor to the various jobs.

The management contractor's function also was to supply over-all job direction along with PRA engineers, helping each camp to apply efficiencies developed in other camps, and effecting exchange or transfer of equipment as the needs on various

fronts dictated. The management firms also helped maintain equipment, through headquarters and field shops, as noted in another section.

No record of construction quantities was kept, but on PRA work a cumulative record of costs was kept against each marked mile. The PRA and management contractors cooperated to maintain careful costs using modern office accounting and cost systems and equipment.

Okes Construction Company

"It looks as though Minnesota road builders move up here in a body," said one fellow. At any rate, there is certainly a lot of Minnesota earth-moving talent represented by the Okes Construction Company, of St. Paul, which under PRA organized fourteen units and built the fine piece of road north of Fort St. John. This job and subsequent follow-up work on Army road clear to Fort Nelson are touched on elsewhere in this issue.

An informal glimpse of Okes' large-scale operations is given in the following notebook paragraphs:

"The Okes headquarters camp is built on a scale comparable to the giant task of Alcan. Scattered over several acres are 2 large office buildings; 3 buildings for administrative staff; 8 barracks, 20 x 120 ft. (CCC Camp sectional buildings, as are many other units here); food storage building; large root cellar; garage and machine shop; 3 equipment warehouses; general warehouse; large mess hall (two CCC buildings joined); contractors' office; first aid building; recreational bldg., with commissary and postoffice; 2 buildings for a large modern tire re-building and repair shop (Canton Tire Co. of Billings, Mont., tire contractor).

"Up here where vital personal supplies such as clothing, sleeping bags and boots are often scarce, a good commissary is an aid in keeping up

the spirit of workers. Okes was selling a huge pile of thick Hudson Bay blankets the day of my visit—merchandise rounded up from north woods trading posts. They vanished like the grub that is so generously served to hungry workers.

"Which brings us to the most important subject of all—food! A construction army up here travels on its stomach, and how! A big factor in attracting labor and keeping down turnover is the string of mess camps scattered along the highway. By agreement each camp feeds all comers, regardless of which contractor is the employer, and tables of hot food of good quality and variety await the triangle at spots seldom more than fifty miles apart along the civilian contract sections of the road. Each worker pays a standard rate for his board and bunk, and only nominal books are kept on the exchange of meals.

"To supply roadside mess camps Okes has stocked over 500 food items, including stores of dehydrated beef, canned stew and other products suitable for emergency rations during periods of flood or other cut-off of delivery."

The Okes firm consists of S. R. Okes, C. Paulda and Day Okes of St. Paul. Staff officers and executives in-

Lt. Col. R. G. Caley, in charge of equipment maintenance, talking things over with W. E. Bates and C. Paulda of Okes Const. Co.



A. W. Schimberg of the Public Roads Administration and J. M. Pederson, of Pederson Bros., Montevideo, Minnesota (an Okes unit contractor)



clude W. E. Bates, chief of operations at Fort St. John; H. F. Goodrich, supply and transportation; Ken Gold, purchasing; E. I. Studer, construction; C. M. Gillespie, shop superintendent; R. L. Sutman, office engineer; Thomas Lepard, superintendent on Army work; W. C. Donaldson, graveling, grading; O. Tressler, warehouse; R. Bessier, accounting.

Unit contractors under Okes comprise these 14 well-known outfits or combines:

Coghlan Construction Co., Rolla, North Dakota (grading).

Adolphson, Huseh, Layser & Welch, Minneapolis (surfacing).

M. G. Astleford Co., Inc., Minneapolis (mostly grading).

Art Bolier, Minneapolis (grading and surfacing).

Frank Legull, Jack and Jud Brown, Adrian, Minn. (grading).

Olson and Reese, Marshall, Minn. (grading and surfacing).

Pederson Brothers, Montevideo, Minn. (culverts and bridges).

Roverud Brothers, Winona, Minn. (surfacing and quarrying).

Sorensen and Volden, Albert Lea, Minn. (grading).

Southern Minnesota Construction Co. (Several outfits; grading and surfacing).

Standard Salt & Cement Co., Duluth, Minn. (logging and clearing).

Volck Construction Co., Rice Lake, Wisconsin (surfacing).

Thomas Bros., Foley, Minn. (grading, some quarrying).

Day Okes Army Contract (utility organization operating under a letter of intent from the U. S. Army; camps, sewers, improvements, lumbering).

R. Melville Smith Company

This contract management firm of Toronto marshalled the resources of 10 (later 12) Canadian companies. It spent a large part of the season building the 48-mile heavily graded standard roadway at the lower end between Dawson Creek and Fort St. John.

Since this section involved placement of selected base and graded surface material, seven crushing and screening plants were used, several having large primary jaw crushers. No unusual methods of construction were involved.

As each unit finished its section of work it moved camp several hundred miles up the road to the stretch north of Fort Nelson, where it aided the Army with follow-up work. One unit, Campbell, aided on a major relocation. Others have done widening, quarrying, or sawmilling for camp buildings, bridge timbers and forms for permanent bridge abutments. Three units—Dufferin, Don and Mac-Namara, the latter being a newcomer—are engaged in preliminary work this winter on permanent bridges in the southern sector.

The Canadian firm, Caswell Construction Co. of Kirkland Lake, Ont., under R. Melville Smith management, operated this roadside saw rig for making camp lumber

Roads and Streets photo



R. Melville Smith

Each of the Canadian units has a small machine shop. Overhauling and restoration of equipment, as availability of parts permit, are high on the list of winter work. Much overhauling is being done in connection with the move-up which is still in progress.

Smith's move-up to the north, together with hauling of supplies, serves to illustrate Alcan's tremendous transportation problem. Shovels as large as 1¾-yd. were needed to work in quarries and heavy cuts for improvements and relocations in prospect. Since mid-fall, trucks and light semi-trailers bearing dismantled shovels and other heavy units have trekked the four hundred or more miles to new location. Because heavy trailers could not be used, a single large shovel often required a half

This hardy Canadian is Alex Klumac, superintendent of Caswell Construction Company's sawmill camp



dozen trucks. The average haul was 460 miles, and the round trip took a week. Hauling will continue all winter to get supplies and rations moved north in time to assure work on the three-month spring repair job when most camps will be isolated.

The R. Melville Smith Company is headed by the Ontario deputy minister of highways whose name it bears. C. H. Nelson is project manager, with W. C. Fox, office manager, and T. F. Francis and Robert Campbell, field engineers. The unit contractors comprise the following firms, the home cities being all in Ontario:

Emil Anderson Construction Company, Fort William.

Bond Construction Company Limited, Kenora.

Campbell Construction Company Limited, Toronto.

Caswell Construction Limited, Kirkland Lake.

Curran & Briggs Construction Company Limited, Toronto.

Don Construction Limited, Toronto.

Dufferin Paving Company Limited, Toronto.

W. H. Harvey & Son, Kingston.

A. E. Jupp Const. Co. Ltd., Toronto.

Wallace A. Mackey Ltd., Weston.

Storms Contracting Company Limited, Toronto.

MacNamara Construction Company Limited, Leaside, Toronto.

few remaining crawlers not picked up had walked the whole way.

The Dowell firm has also helped build several temporary and permanent bridges.

Under Dowell management are the following Western U. S. contracting outfits:

J. S. Ramstad, Seattle (grading).

Angeles Gravel Supply Co., Port Angeles, Wash. (bridges).

L. L. and R. W. Byers, Los Gatos, Calif. (grading).

J. C. Dawson, Bellingham, Wash. (grading).

Hugh Govan & Adler Construction Co., Port Angeles, Wash. (grading).

E. T. Haas, Ken Royce & R. Johnson, San Francisco (grading).

Joe A. Jussel, Seattle (grading).

C. E. O'Neal, Ellensburg, Wash. (grading).

W. C. Thompson, Santa Cruz, Calif. (grading).

In the Dowell organization, L. J. Dowell is project manager; Ross E. Woodward, asst. project manager; Larry Wick, equipment supt.; Charles Brace, supply supt.; Mark Klinefelter, sub-depot manager; Fred Redmon, servicing manager; Paul Turner, service assistant; Jim Daniels, bridge engineer; M. L. Crawford, office. Charles Starwick in Seattle is purchasing agent, with Leo Mortland as Seattle office manager.

Dowell Construction Company

Another well-known contracting firm which has played a leading part in the building of this road is the Dowell Construction Co. of Seattle. Early in May the Public Roads Administration commissioned them to round up a phalanx of unit contractors under their management to move on the project by water through Skagway. This firm acted so speedily that by June, nine outfits had pooled with Dowell and machinery was on the way North.

Dowell established a headquarters camp and shop at Whitehorse, comparable to the Okes layout previously described, and by Aug. 1 was in high gear on the 50 mile PRA-designed section southeast of Whitehorse to Jake's Corners. The whole outfit is proud of this 24-ft. wide job involving many heavy cuts and fills up to 40 feet, which was cleared and graded in two months.

Subsequent to the completion of this job, Dowell, like other contractors has spread out over many miles of Army pioneer road to help widen, improve and surface—a task which was still in progress but retarded by lack of equipment when winter set in. One of Dowell's contractors, Govan & Adler, built part of a 22-mile cut-off to straighten an earlier section of Army road north of Whitehorse. This partly-completed job is held up until Spring because all available equipment in this area was needed to complete the road through to Fairbanks before winter. Toward year's end, Dowell's camps were up toward Alaska, improving and graveling.

This outfit is a fast mover, literally.

For example it worked a neat trick to expedite a 140-mile move of an entire camp including heavy equipment. While tractors, trucks, graders, shovels, and camp stuff started walking down the road, the only two available machinery trailers went on ahead with loads, returning and picking up the first machines they met. Trailers shuttled ahead on successively shorter hauls until finally the

Lytle & Green Construction Co.

Alaska was full of Iowa road builders last summer, no less than fourteen unit contractors from that state working under Lytle & Green management. Their big primary job was the stretch of road southeast of Big Delta for 110 miles. Following this the boys stretched out further southeast and helped the army with follow-up

work on some of the last mileage to be opened to traffic.

Much could be written of the resourcefulness exhibited by these fellows in fighting supply and transportation difficulties. Though the call to go to Alaska did not come until late in May, by early July, in spite of boat shortage, loads of machinery

L. J. Dowell (right) snapped on a frosty December morning with H. L. McLennon (left) of the Glenn Carrington Company and Paul Turner (center), Dowell's construction superintendent. At left is Larry Wick, of the Dowell firm





FLASH!! Here is the first party to negotiate the last-completed link of the Alaskan Highway south from Fairbanks in a civilian passenger vehicle. Photo taken on arrival at Whitehorse, night of November 22, by **ROADS AND STREETS'** Associate Editor, Harold J. McKeever. Left to right: Floyd K. Brown of the Lytle & Green Construction Company, Sioux City, Iowa; C. G. Polk with the Public Roads Administration; C. Coykendall of Lytle & Green; and E. C. Henningsen of Western Engineering Company, Harlan, Iowa.

had reached Valdez and were being sent to base points. Over 1200 workers were flown in, day by day, to get camps and work crews organized at the northern end of the line. A good word should be said for the Iowa workers—they endured the mosquitoes, primitive life and long hours with little labor turnover.

The Lytle and Green firm consists of the two well-known contractors, C. F. Lytle of Sioux City and Green Construction Co. of Des Moines. O. W. Crowley was project manager; Robert Cramer, office manager; C. E.

Molzen, camp superintendent. Their field engineer was C. Coykendall (from Iowa highway commission); assistant field engineer Floyd K. Brown (recently County Engineer of Keokuk County, Ia.).

Lytle & Green unit contractors:
E. M. Duesenberg, Inc., Clear Lake, Ia. (grading).

Duval and McKinney, Logan, Ia. (bridges).

Frank Eblen & Orville Eblen, Cumberland, Ia. (grading).

Frank Eblen & Hilding Ekdahl, Cumberland, Ia. (grading).

Alcan Highway passes through only four towns between terminals. This is the main street of Whitehorse, Yukon Terr.



ROADS AND STREETS, January, 1943

J. Leo Hoak, Des Moines, Ia. (transportation).

William Horrabin Contracting Co., Iowa City, Ia. (grading).

V. L. Lundeen, Inc., Montezuma, Ia. (grading).

Gus Ostermann, Ocheyedan, Ia. (grading).

L. Peterson, Cedar Rapids, Ia. (bridges).

J. W. Scothorn Construction Co., Cherokee, Ia. (grading).

Sears Construction Co., Clear Lake, Ia. (grading).

Ira Van Buskirk, Hawarden, Ia. (grading).

Welden Brothers, Iowa Falls, Ia. (bridges).

Western Engineering Co., Harlan, Ia. (bridges).

E. W. Elliott & Company

The Seattle firm of this name, with E. W. Elliott, widely known Washington road builder, operated as a transportation contractor and camp builder for the road, and subsequently aided in some phase of follow-up improvement on about 260 miles of Army road in Yukon territory.

James A. Davis, general manager, is a former Washington state highway director. R. B. Johnson is supt.

Elliott's first job was as a shipper. To help meet the shortage of "bottoms" between Seattle and Alaska ports, he converted several pleasure yachts into freighters and made several sailings a week all summer with machinery and supplies for the road. Much freight was towed on improvised sea-going barges. Resurrection of a discarded 75-year-old sailing ship, which made thirteen trips as a tug to Valdez, is among his proud accomplishments. Altogether 5 steamships, 1 motor ship, 5 yachts, 14 barges and 10 tugs were pressed into service.

Such resourcefulness early in the year was a factor in speeding supplies into the Alaska end and in setting up warehouses and other base buildings.

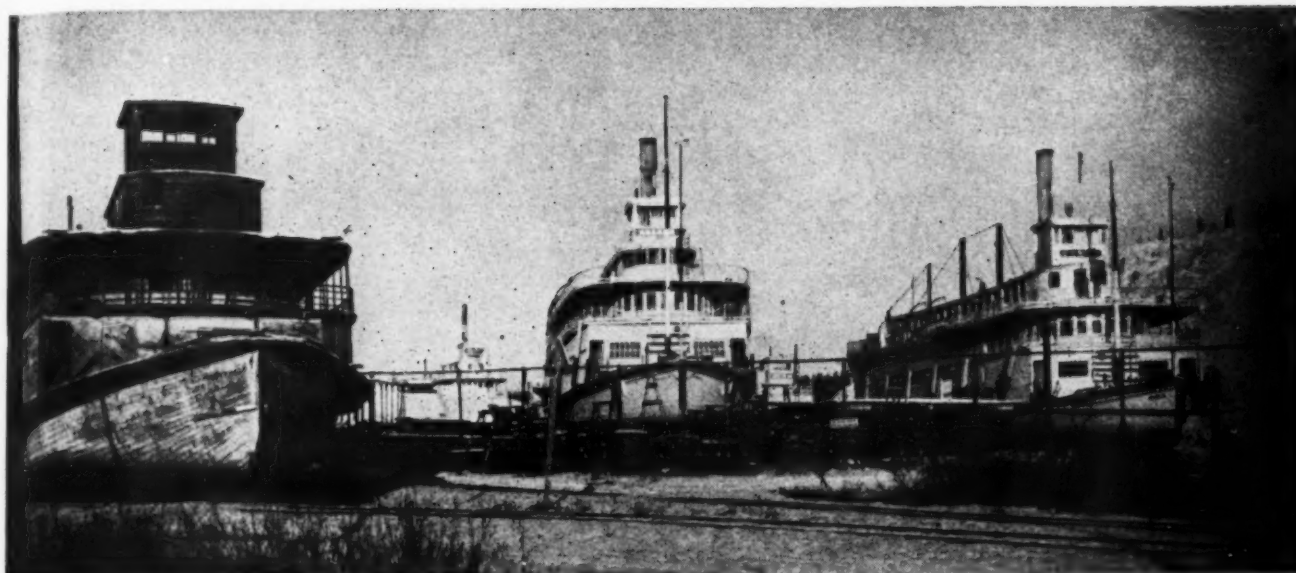
E. W. Elliott (right) and Superintendent R. B. Johnson of E. W. Elliott & Company



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Roads and Streets photo

Alcan Highway will help open up areas of Yukon Territory heretofore reached in summer only by boats. Sternwheelers such as these tied up at Whitehorse figured in gold rush days and more recently carried tourists

6—Historical Notes

Alcan Highway is the culmination of many plans to pierce the Northwest to Alaska

THE vast forest penetrated by the Canada-Alaska Highway has always been an obstacle to man. Scientists tell us that in some remote pre-historic time the first human beings to set foot on our continent probably migrated from Asia by way of Bering Strait and Alaska and down the valleys paralleling the Pacific Coast.

Modern attempts to enter the region date from the last century when explorers were followed by engineers who surveyed a telegraph line.* This line was started in 1865, but soon abandoned.

The 1898 Klondike gold rush brought fresh attacks on this mountain vastness. Hundreds of gold seekers started overland on foot, by river boat or with pack trains. Many died of scurvy or exposure. The handful who ever got through took two years! Others turned back. It is said that one reason for the extensive early clearing of farms in the area north of Edmonton is the fact that many prospectors stopped here and took up land.

First serious thought of a rail line came soon after the turn of the cen-

tury. E. H. Harriman, famous railroad builder, was behind an ambitious plan to link the United States with Siberia through Alaska, and preliminary engineering was well advanced when this idea, too, was dropped.

Meanwhile up to 1942 only winter pack trails existed. Travel in summer depended mainly on fantastically round-about waterways. For example, to get from Edmonton to Fort Nelson, now about 800 miles away by road, one went by rail from Edmonton to Waterways; along the Athabaska River and Athabaska Lake to Slave River; Slave River to Fitzgerald; by portage to Fort Smith in the Northwest Territories; Slave River and Great Slave Lake to the head of the McKenzie River; to the mouth of the Liard River; by Liard River to the mouth of Fort Nelson River; and then to Fort Nelson—nine months!

Or more recently one could fly it in a few hours.

Recent Highway Proposals

The idea of building a highway to Alaska took form in 1928 when Donald MacDonald, an engineer with the Alaska Road Commission, outlined a route from Hazelton, B.C., to Fairbanks. Through organized promotional efforts, which included the forma-

tion of an International Highway Association, this road was given widespread publicity and support. In 1930 President Hoover appointed three commissioners to meet with representatives of the Canadian government to study the feasibility and location of a route. This commission's work was dropped during the depression, not however until it had done considerable constructive work toward a plan of action.

In 1938 the project was revived and the Alaskan International Highway Commission was formed by President Roosevelt, headed by Congressman Warren Magnuson of Seattle, and including Ernest Gruening, present Governor of Alaska; Thomas Riggs, a former Alaskan Governor; James Carey, a Seattle engineer; and Donald MacDonald of the Alaska Highway Commission. A similar Canadian commission known as the British Columbia-Yukon-Alaska Highway Commission was also formed. Both groups made some aerial surveys, and two routes were projected, one being near the coast and following the general line of the road advanced a decade before.

Then came the war, and favor switched to a more easterly route, starting at Prince George and touching Sifton Pass, Frances Lake and Dawson. War developments, however, soon showed the necessity of quick action on a route still farther eastward, well back from the coast and

* The historical background of Alcan highway is authoritatively treated in an article, "The Strategic Route to Alaska," by Shelby A. McMillion, Major, Corps of Engineers, in *The Military Engineer*, November, 1942.



Army-built roadway skirting Klane Lake. Mile-high mountains rising to the left give this setting a beauty rivaling the Canadian and American mountain parks

P R A photo

in a location designed primarily to serve military airports of Canada. Because Canada had little economic justification for undertaking construction on a joint basis, the decision was made that the United States would undertake a road on its own. The rest is history.

The Bedaux Expedition

Most colorful chapter, and the one previous major attempt at actual construction of a north road is what is known around Edmonton as the "Bedaux Expedition." In 1934 Charles

E. Bedaux, famous industrial engineer and pioneer of industrial efficiency systems invaded the woods above Fort St. John with four Citroen half-track motor cars of a type then used by the Swiss Army. He had previously developed the idea of a road while hunting in the region. Mr. Jack Babcock of Edmonton, a mining engineer, had been his guide. His objective was a trail blazing trip to Telegraph Creek, in upper B. C.

His method was to send ahead several parties to clear a path or widen existing pack trails of trappers.

Whenever the party came to a stream it used rubberized cloth pontoons for their outfit, and intended to float the Citroens across on rafts.

From Fort St. John the party of 35 or 40 left the last existing road and started overland. Several rivers were crossed. But the obstacles soon were found to be insurmountable; rafts alone represented long toil.

The tractors finally developed track trouble and were abandoned. Two of them are said to be still in the woods. One tractor went on downstream and was later salvaged by a trapper who wanted the motor for a power plant.

Then the party took horses and struck out afresh. C. E. Lemark, a civil engineer and one of the guides, finally reached Telegraph Creek—the only one to get through. Hoof rot, a disease which the horses suffer in the woods from standing in damp ground, was the final disaster. The rest turned back.

At the end of his expedition Bedaux is quoted by newspapers as saying, "We've laid out the start of the highway to Alaska!"

Actually, the first "highway" was a series of pack trails blazed by Klondike gold rushers at the turn of the Century. And the Royal Northwest Mounted Police had cut a pack trail up through Burns Lake into Alaska. But regardless of whether Bedaux was first to make the attempt, his courage was an inspiration. Courage and determination, as much as machinery and planning, finally resulted in the Alcan Highway of today.

Governmental Agreement on Alcan Highway

On March 18, 1942, Rt. Hon. W. L. Mackenzie King, prime minister of Canada, and Hon. J. Pierrepoint Moffat, minister from the U. S. in Canada, exchanged notes of agreement on the Canada-Alaska Highway. These are summarized as follows:

1. THE UNITED STATES to make surveys and build the road, using Engineer troops for surveys and initial construction.

2. Arrange through the Public Roads Administration for speedy contract work necessary to complete the road, using Canadian and American contractors.

3. Maintain the road until six months after the war unless Canada wishes to assume responsibility for the Canadian portion.

4. Agree that at the war's end

the Canadian portion shall become an integral part of the Canadian highway system, with no discrimination between Canadian and U. S. civilian traffic.

1. CANADA to acquire necessary right of way, title to remain with the Crown in the right of Canada, or of the Province of British Columbia.

2. Waive all import duties, toll or other charges for road shipments in either direction between U. S. and Alaska.

3. Remit Canadian income tax for American workers and corporations employed on the road.

4. Facilitate entry of necessary road workers into Canada.

5. Permit necessary use of timber, gravel and rock from Crown lands along highway.

FROM ALASKA..



..TO PANAMA

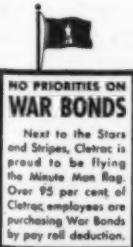
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THE CLEVELAND TRACTOR CO., Cleveland, Ohio



Cletrac Crawler Tractors

GASOLINE AND DIESEL



Alcan Yarns . .

(Some True)

Picked up in the Okes Camps

Early last spring while John Boyle of the firm of Reese and Olson was sleeping in a tent in company with Lieutenant Van Dyche, a bear nosed into their tent and sniffed around the floor trying to follow tracks over to Boyle's cot. Boyle stuck his head out of the sleeping bag and said, "If it's tracks you're looking for, I'll make you some!"

Mosquitoes are the bane of existence along the Alaska road in summer. One mosquito in a tent said to another, "Don't eat 'em here, let's drag them outside." "Hell, no," the other replied. "If we do, the big fellows will get 'em." (Credit for this yarn is claimed by the Okes, Dowell, and Lytle & Green camps. At least, their mosquito miseries were all real.)

"I've got *twelve* grandchildren now," said Sam Lee of Standard Salt and Cement Company, running out of the post office tent. "I've just got another letter." Lee's with an outfit that helped do clearing and logging below Fort Nelson.

Anyone who has never seen a Finnish bath should see the one rigged up at the Standard Salt and Cement Company Camp. Big stones piled around a home-made stove, with home-made stove pipe . . . a row of bleacher-like seats all along both sides of the room. This is a favorite rite among this outfit's big husky Swedes, Norwegians, Finns and Danes from the Minnesota country. As if they didn't get enough sweating out along the highway!

To look at the big headquarters camps of Okes, R. M. Smith and the Public Roads Administration which adjoin each other at Fort St. John, you'd never believe that the site was once dense forest. Mr. Paulda of the Okes Construction Co. likes to recall how the camp location almost had to be changed to avoiding disturbing a nest of grouse eggs in the underbrush. But the critters finally hatched and clearing was able to go on.



ROADS AND STREETS, January, 1943



Roads and Streets photo

Bears: This means you! How spikes were driven under windows to discourage bears from breaking into the camp kitchen shack. Camp of Southern Minnesota Const. Company

And from Elsewhere Along Alcan

This one is true. An Indian chief at the Teslin Lake settlement, near the new road, brought an ancient Chevy by barge from Whitehorse (five days away by dog sled) and built himself a three-mile road to run up and down on. This was related by the Mountie who took your editor through the Indian village.

In contrast with the state of affairs down in our country, the Teslin Indian girls are suffering from a shortage of Wolves. Members of the Wolf and Crow Tribes by custom must marry into the opposite tribe, and eligible Wolf boys are scarce.

One of the highlights of courage among the Engineer regiments is the way colored boys in one unit waded last October into the icy water of the Sikinni and placed timber bents while waist deep. They were made happy by a barrel of beer for a fast bridge job well done.

Even latrine digging is mechanized along the Canada-Alaska Highway. At Fort Alcan, near Fort St. John, army southern sector headquarters, the job is done with a Barber-Greene Ditcher brought in to install camp sewers. A ten-holer in ten minutes is the record.

Transportation note: Near Whitehorse local citizens still talk about the days when freight was hauled five miles on a dog railroad. One can still see the old log rails.

Correct Lubrication...

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BEST FRIEND!

If wire ropes are to give their best service—yes, even longer-wearing **HAZARD LAY-SET PREFORMED**—they must be lubricated regularly—and correctly. Not only will proper lubrication protect the many wires from corrosion and excessive wear, but will permit the internal wires which move one against another when the rope passes over a sheave or winds on a drum, to slide more freely and with less friction. For some short-lived services, factory lubrication is sufficient. For others, additional lubricant must be added in the field, and unless this is done with sufficient frequency, your wire rope is doomed to fail before its proper time. And this is no time to waste steel.

HAZARD LAY-SET PREFORMED WIRE ROPE ordinarily gives so much better, easier-handling, longer service than ordinary non-preformed rope that occasionally operators take its exceptional qualities for granted and forget the oil can. Don't do it. Lubricate your **LAY-SET** correctly, and you will get even longer service—even greater dollar value. All Hazard ropes identified by the Green Strand are made of Improved Plow Steel.

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AMERICAN CHAIN & CABLE COMPANY, INC. Bridgeport - Connecticut

● IMPORTANT SUGGESTIONS

Clean wire rope thoroughly before lubricating. Use kerosene and wire brush.

Passing the rope through high-pressure jetted steam has proved a very effective means of cleaning, especially larger diameters.

Wipe off excess lubricant.

Frequent lubrication with light-bodied lubricant is better than infrequent treatment with heavier lubricants.

Lubrication of any wire rope is sufficiently important to warrant calling in one of the industrial lubrication men employed by oil companies or a Hazard man. These men can tell you which lubricant will handle your problems best.

HAZARD LAY-SET *Preformed* **WIRE ROPE**

AIR-POWER NORTH TO TOKIO...



Ask them along the road to Fairbanks what Blue Brutes can do. The builders wanted rock-blasting air-power they could count on for the toughest construction job since Panama. They took Worthington Blue Brute Compressors and Air Tools — in "uniforms" of olive drab.†

Over 1200 miles of boggy marshland, swamp-traps, axle-busting mountain peaks, through mud and ice, they helped blast the Alcan highway through. Alaska's, Tokio's fate hangs by that road-thread. Blue Brutes stood action's test.

Worthington Blue Brute Compressors

... portable and semi-portable ... gasoline, diesel and electric driven ... have staying power in a pinch because like road-trained champion heavy-weights they're gentle-breathing. The improved Feather* Valve stops gulping "back talk", when lesser breeds whine for the tool shed. *They deliver more air, steadily, per power-dollar.*

Smooth, easy-handling strength makes Worthington Rock Drills and Air Tools also your best "brutes" for fast, historic construction. Sturdy, quality-strong, they *use less air.* Your test will prove it.

†Blue Brute Compressors and Air Tools are painted olive drab for the Army. *Reg. U. S. Pat. Off.

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Oklahoma City
OREGON
Portland
PENNSYLVANIA
Easton
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Middleton — S. T. Randall, Inc.
New York — Hubbard & Floyd, Inc.
Olean — Freeborn Equipment Company
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Syracuse — Harrod Equipment Company
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Marietta — Northwest Supply & Equipment Co.
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OREGON
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PENNSYLVANIA
Easton — Sears & Bowers
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Oil City — Freeborn Equipment Company
Philadelphia — Metalweld, Inc.
Pittsburgh — John McC. Latimer Company
Wilkes-Barre — Eusminger & Company
SOUTH CAROLINA
Columbia — Bell-Lott Road Machinery Co.
SOUTH DAKOTA
Sioux Falls — Empire Equipment Co.
TENNESSEE
Chattanooga — James Supply Company
Knoxville — Wilson-Weesner-Wilkinson Co.
Memphis — Tri-State Equipment Company
TEXAS — Dallas — Shaw Equipment Company
Houston — McCall Tractor & Equipment Co.
San Antonio — Patten Machinery Company
VIRGINIA
Richmond — Highway Machinery & Supply Co.
WASHINGTON
Seattle — Star Machinery Company
WEST VIRGINIA
Fairmont — Interstate Engineers & Constructors
WISCONSIN
Eau Claire — Bradford Machinery Company
Green Bay — Nelson Machinery Company
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Buy Blue Brutes

Worthington Pump and Machinery Corp.

Kenosha Makes Own Street Signs

Some months before the war began the city of Kenosha, Wisconsin, had already started making its own street signs and markers. Over two hundred have been turned out to date under the supervision of a veteran street-sign man, Paul Terpstra, using a design which greatly reduces metal requirements. Whereas standard factory-purchased signs previously used were made with 12-gauge metal, the shop-made articles are made with very light 26 or 24-gauge metal, backed with pieces of 3/4-inch plywood. This far-sighted step in self sufficiency insures Kenosha of well-marked streets through the war period without dependance on factory supply.

Signs include octagonal, diamond-shaped, circular and rectangular traffic markers of standard types, and miscellaneous directional and parking signs. A metal cutting template is kept in the shop for each type, and both the metal and plywood pieces are made with such accuracy that the city's expert tinsmith does a "professional" job of crimping the two metal faces together around the edges, soldering and making a weather-tight, durable sign.

To save metal and simplify replacement on existing posts and standards, most signs are made without bolts; just a slot for inserting and driving



Kenosha's streets are marked by more than two hundred traffic signs made in the municipal shop

tight. Signs are painted and lettered in the paint room, after which they are good for several years' service barring the hazards of small boys, Hallowe'en, etc.

Robert M. Smith is city engineer of Kenosha.



After painting and lettering in city paint shop, signs are inserted in standards without use of bolts or rivets

Editorial

Alcan Highway—a Great Achievement

ALCAN HIGHWAY deserves a place among the great construction feats of our time.

Its greatness lies not in the difficulties overcome; muskeg and forest have been conquered before. Nor in its size; American engineers have taken all manner of gigantic works in their stride in this War. Its greatness lies in its unprecedented speed.

Credit for completing the Alcan Road months ahead of schedule is shared right down the line. Organization and equipment of the job, establishment and maintenance of supply lines, generalship in the field—each is a notable chapter; and Corps of Engineers leaders, together with Public Roads Administration engineers and American and Canadian contractors, should all feel proud of their part.

But the limelight belongs to a special person—The American Soldier.

Here, as on all outstanding construction jobs, there was to be found a spirit far beyond mere “working for wages.” Team work, patriotism, pride in beating the promise—call it what you may—that factor existed in high degree in the work camps, as regiment pitted itself against regiment.

“Make no mistake,” said Colonel E. G. Paules, Alcan’s northern sector commander, “the real credit belongs to the men in the ranks.” The hardships, privation, long hours and lack of recreation tested the troops to the limit. But they took it. The Corps of Engineers has again earned the tribute that General Pershing once paid it:

“... the scientists said it couldn’t be done ... the damn fool engineers didn’t know that—so they just went ahead and did it!”

What Equipment Advance from Alcan?

DIFFICULT construction projects often point the way to advances in equipment design. Alcan Highway should yield such a by-product. To build this road the biggest assemblage of road building machinery in history was pitted against wilderness conditions. Hundreds of units were wrecked or worn out in a single season.

No “dark horse” designs were tested here on a large scale. This was a battle of stock models. The trainloads of machinery rushed to the project from assembly lines, dealers, highway garages and contractors’ outfits were familiar, time-tried units. The Army knew they would do.

Nor were any fundamentally new tricks of equipment usage employed. Tractors and scrapers and graders and trucks and all the other machines simply delivered the output builders have come to expect of them.

However, we venture belief that the Alcan experience will point to numerous refinements in design and perhaps contribute to the development of even faster,

tougher and more efficient units for post-war road construction.

The opportunity lies in a study of mechanical failures. Under orders to push the job to the limit of human endurance, the commanders deliberately pushed also to the limits of mechanical endurance and sometimes beyond, counting the sacrifice of many machines as a small price to pay for completing the road by winter. Hastily trained operators crashed down trees in a desperation of hurry. Scurrying tractors and trucks toppled over embankments. Trucks winched and “gramma’d” through deep mud with groaning loads. Servicing was skimmed in spite of every effort to follow proper maintenance routine. Field repair methods were of necessity primitive.

Inevitably the pace was a killer, and by autumn a great many machines were out of the running. Army and contractor shops along the highway, where a huge overhauling and repair program is in progress this winter, should furnish valuable clues for machinery betterment.

**Care and Repair
in Shop and Field**

CONSERVATION ROAD

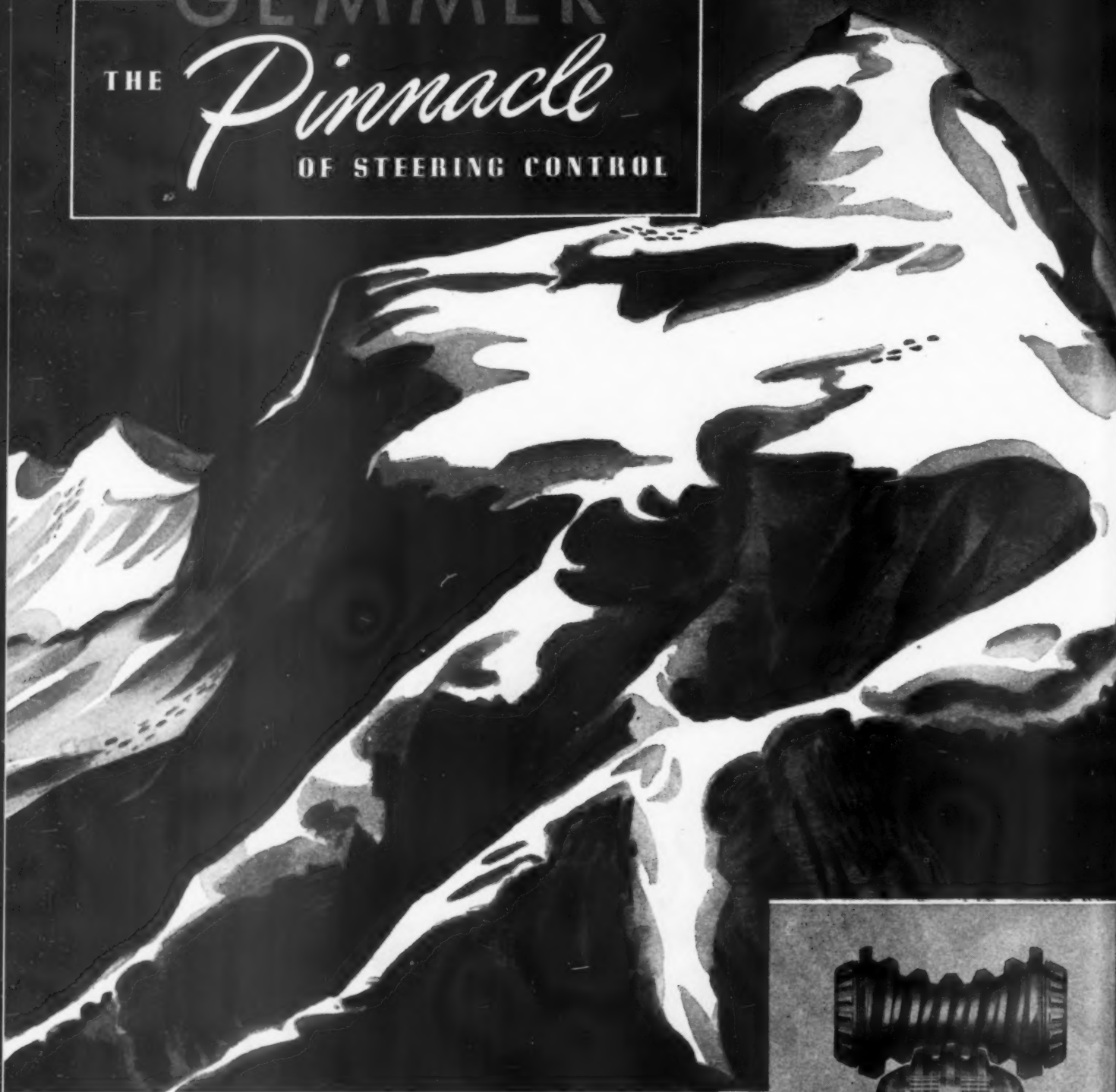
CONSTRUCTION EQUIPMENT MAINTENANCE

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Equipment Maintenance

"Preserve! Conserve!" Watchword for 1943

Since the Equipment Maintenance Section of **ROADS AND STREETS** was inaugurated last October, the need for taking extraordinary measures to keep equipment rolling has heightened steadily. Each passing month additional thousands of older tractors, scrapers, graders, compressors and other units reach the "baling wire" stage. Whereas normally it would be economical to scrap these machines, now they must be kept in shape at all cost for vital maintenance and construction service. This means new kinks, new shop routine, most of all a *new approach* to the job. Further complicating the problem is the necessity for training new shop and maintenance men as employees enter service or war production.

In this connection have you seen the excellent new operating and repair manuals which machinery houses have issued recently? Although many of these were prepared expressly for military use, they are frequently available to civilian users.

In this Section we will continue to publish excerpts from the best of these new manuals, and also "how it was done" stories from the field. If your shop men have turned up with interesting new methods and kinks, tell us about them. Share your knowledge! It will help others conserve materials and preserve irreplaceable machines for the duration.

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School time on the Alaskan road. This regimental unit is being instructed on tractor care and operation

U. S. Army photo





Roads and Streets photo



Combination gas, oil and grease truck servicing one of E. W. Elliott & Company's shovels. (At right) Okes Construction Company serviced its thousands of heavy tires in a large modern shop, operated by Canton Tire Co. of Billings, Montana. Spread out in two 20x100 ft. CCC buildings were 6 recapping molds, 4 vulcanizing molds, 5 spreaders, a buffer, steam plant and light plant

7-Equipment Repairs And Maintenance On Alcan

Despite parts shortage and lack of field shop facilities,
Army and contractor crews kept machinery running

BUILDING Alcan Highway involved one of the largest aggregations of heavy equipment ever assembled for a single job. Most of the Army's units were new. The Army's decision was not to have central repair shops during the pioneer construction, but to depend on field repairs. Each regiment was responsible for the upkeep of its outfit. Most fixing was done right where the machine broke down, using tool kits with which the regiment was well supplied. Timber A-frames and tripods for lifting out engines or raising tractors for track repairs were a common sight along the road. Each regiment however had one heavy-duty wrecking truck, and other hoist trucks were fashioned by setting timber A-frames on front bumpers.

"Keep Them All Going!"

Primitive methods were used to keep machines rolling, and an acute shortage of parts demanded great resourcefulness from the Army boys. The order was to keep all units going as long as possible; junking of

units for spare parts was permitted only as a last resort. Convertible welding trailers were available, and welders who built up worn surfaces and restored broken parts were star performers. Small regiment repair shops worked wonders rebuilding, converting, making parts that could not be obtained.

By late Autumn due to hard usage many units were out of commission, but like good soldiers the survivors were still at the "front" fighting. In their resourcefulness the Army men set a splendid example for the beleaguered road contractors and highway maintenance shops today at home.

To expedite the overhauling now in progress, the Army this winter has set up extensive central shop facilities and has taken over the procurement and handling of all parts for civilian as well as its own equipment on the project.

Contractor Equipment Notes

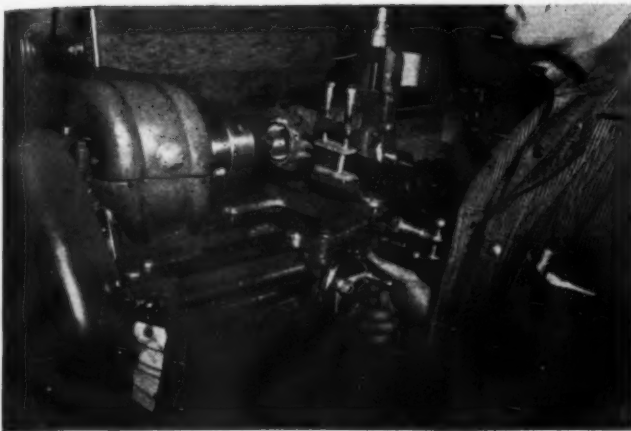
The size of the contractor equipment outlay is indicated by the fact

that one management firm alone had over 1400 major pieces of rolling equipment. In addition to their own outfits, the civilians were supplied with a great quantity of machinery transferred from CCC camps of the western states. Among these were 300 tractors equipped as scrapers, bulldozers or trailbuilders, 1000 trucks, 125 air compressors with drilling accessories, 55 power shovels, 200 electric light plants, 65 portable repair shops, mixers, rollers, pumps, trailers and other equipment.

Also from forty CCC camps came kitchen equipment and barracks for construction workers.

The contractors had fairly good equipment at the start, but not all machines were perfectly overhauled due to the short notice in getting the units rounded up and shipped. Contractors, however, had the advantage of having many experienced operators, and Uncle Sam let a lot of fellows stay through the year on a draft-deferred basis. They also had more elaborate central repair shops at their project headquarters.

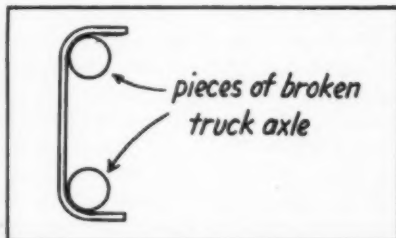
Equipment furnished by the contractors was used on a rental basis, which included a standard hourly rate for each type and size of unit. Maximum rental allowance for the year for trucks was 40% of the purchase



Roads and Streets photo

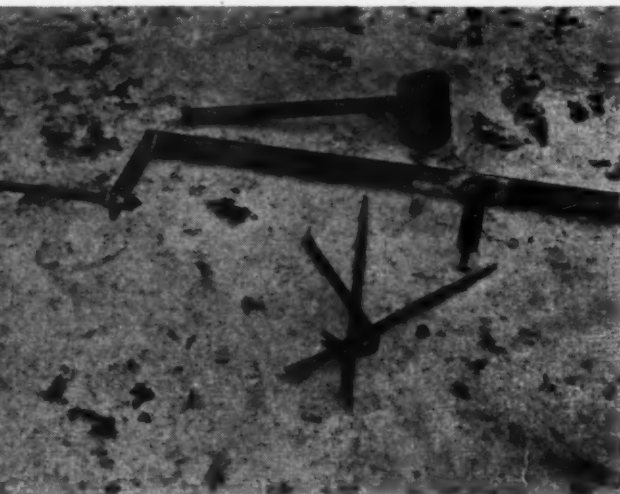
price on an 8-hour basis, or 60% for 16 hours; for tractors, 25% and 37½%. Units were required to be in good initial working order on arrival, or repaired at the contractor's expense before going on rental. Otherwise, repairs were borne by Public Roads Administration funds as part of the job expense.

In spite of an AA-2 priority rating, the parts problem was acute with the contractors, too. They were allowed to retain old parts as scrap metal for use in shop manufacture of needed items. The various contractor camps



(Fig. 13) Showing how one Army repairman spliced broken truck frame channels, by welding lengths of broken truck axles into the channel corners. Ordinary seam welds made in the field didn't hold up, but this trick provided plenty of strength and resiliency!

Roads and Streets photo



New connecting-rod bearing being reamed. Hundreds of rods are re-babbitted in the Okes shop

(Right view) "Repair it—rebuild it—MANUFACTURE it, if necessary," is the slogan in Okes Construction Co.'s shop on Alcan Highway. Here at the left is a sprocket for a crusher drive which was restored by welding broken and worn teeth. At the right is a home-made companion sprocket, cut from 1-in. steel plate; it will be finished by inserting keyed hub, made from 4-inch-thick steel

lent machines back and forth freely and exchanged units to aid the general efficiency.

Okes' Modern Repair Shop

Typical of the well-equipped (but never large enough) repair and machine shops at the several management contractor headquarters is that of the Okes Construction Company at Fort St. John. It included one 12-in. and two 16-in. lathes, a large and a small drill press, surface grinder, large planer, milling machine, shaper, 7 piston pin grinders, 7 piston grinders, Barrett drum lathe, 3 portable electric welders (gas driven), electric-driven shop welder, 4 acetylene outfits including one specially for gear cutting, 2 steam cleaners, mod-

ern electrical test bench, portable hoist, armature lathe, 2 forges, greasing equipment for eight vehicles at once and 50 kw A.C. light plant. The shop has never run on anything but a 24-hour-a-day basis.

Hundreds of novel repair and part-making jobs have been done in this shop. As the writer came in, the boys were building a new line shaft for the shop planer and building up burnt-out motor valves and heat treating them for further service. Shop pulley gears, lathe gears, and other items throughout the place were home-made. In the few days previous, they had lathe-turned new shafts for a mechanical ditcher used

(Left) Repair shops along the line also suffered a lack of replacement parts and tools. Here are a chisel and punch, made from a piece of broken grader spring (similar to the one shown), in the Southern Minnesota Construction Company shop. (Right) More home-made tools along Alcan Highway—a babbitt ladle, axle truer, wrecking bars, lining pin (latter from concrete reinforcing bars)



Checking the bulldozer hydraulic control on one of Dowell Construction Co.'s Cletrac 55's. Alcan Highway's huge fleet of heavy units is being reconditioned systematically this winter under Army supervision

for camp sewers and made sprocket teeth in connection; built up the teeth on a crane swing gear (a routine job), and used the welder to rebuild crane track rollers.

Other war-emergency items reported by the Okes' shop superintendent:

Snow plow frame made out of 4-in. tubing, involving drilling of bolt holes and flattening one end for clevis bolt connection.

Connecting-rod bearings babbitted and finished—a routine "mass-production" job here, involving lathe turning and hand sawing of oil grooves. (See photo.) A home-made babbitting jig speeds this job.

Bolts and nuts home-made in a wide range of sizes—also routine. A big hexagonal nut for a 2¼-in. bolt was being finished on a planer.

Crusher chain-drive sprockets made from stock metal. (See photo.)

Rock crusher drive shaft gear, turned and cut from a single piece of stock plate.

Bearing race for a light plant rebuilt, as part of job of taking off the generator and connecting it into a saw rig.

In Field Shops Too

Later, along the way, the writer saw the "necessity-mother-of-invention" principle still at work. At Okes' Camp 2 a small shop was set up with a drill press, forge, emery wheel, acetylene outfit and portable arc-welders. The men here had "forgotten about" most of their accomplishments, but were able to recall these few:

Final drive gear of an Allis-Chalmers tractor—repaired by putting in three new cogs and building up

twelve more with the welder. Has run three months since.

About five hundred truck springs—repaired with welding.

The master clutch from an RD 8 Caterpillar tractor, cut down to fit an Allis-Chalmers HD 14.

New twin-carburetor system for an Allis-Chalmers tractor—built by using two old single carburetors; machining down involved.

Front idler on a WK Allis-Chalmers tractor (bearing was gone, half of hub cut off)—repaired as follows:

Three pressure plates from rollers were packed, installed and allowed to rub against one another in place of bearings. This job had stood three months of service.

Around the camp was further evidence that shortages could be met—even to light bulb sockets. When sockets ran out, bulbs were kept going by soldering wire connections (and hanging them out of reach).

Among the home-made shop tools in evidence were those pictured on the preceding page.

And here, as everywhere along the highway, gasoline drums were being made into wood stoves for camp tents and bunk houses. Fancy double-deckers among them.

Much of the data given above could be duplicated at the other contractor outfits to the north. At the time of visiting the Dowell Construction Company's big 80x200 ft. shop building at Whitehorse, the shop men were finding time after routine overhauling to make bolts for a home-made freighting sleigh, and truck-spring center bolts, of which hundreds have been turned from mild steel for lack of better material. Nothing of metal is thrown away here. "We even put cold patches on the radiator hose," said the foreman.

Up in Alaska Mr. Coykendall of Lytle & Green reported one interesting trick in their field repair shop. In heavy tractor work, flanges of nearly all track rollers sometimes become worn or broken on one side. About 50% of the rollers were simply turned around and the machines kept on going. "The showing each unit contractor made usually depended on the availability of arc and acetylene welding equipment and the ingenuity of the mechanics," said Coykendall.



Roads and Streets photo

Scene in Dowell Construction Co.'s Alcan repair shop, which was also a "factory" for war-scarce parts.

Splicing Wire Rope

THE relation of rope splicing to equipment maintenance and conservation warrants a description of approved methods in this place. Where original splices are required good workmanship makes the rope last longer; and much otherwise waste rope may be salvaged by judicious use of the marlin spike. The text and illustrations following are taken from the American Steel and Wire Co.'s handbook, "Valuable Facts About the Use and Care of Wire Rope."

For convenience in reference and the avoidance of possible confusion, the original figure numbers (19 to 32) are retained. The book may be obtained by addressing the company at Rockefeller Bldg., Cleveland, Ohio.

Directions for Splicing 6 Strand Ropes

When a rope is spliced endless, or

two similar ropes are spliced together, a short length of each of the two ends is consumed in making the splice. This should be considered when ordering the lengths to be spliced.

There are two endless splices: the Standard Short Splice used for splicing most six strand ropes; and the Long Splice used for splicing Haulage Ropes and long lengths of wire rope operating under heavy loads. The Long Splice differs from the Standard Short Splice in that the distance between tucks and length of tuck is greater and more rope is consumed in making the splice. Otherwise the two are the same.

The total amount of rope to allow for making endless splices is:

Diameter of Wire Rope in Inches.....	$\frac{1}{4}$ - $\frac{3}{8}$	$\frac{1}{2}$ - $\frac{5}{8}$	$\frac{3}{4}$ - 1	$1\frac{1}{4}$ - $1\frac{3}{4}$	2 - $2\frac{1}{2}$	3 - $3\frac{1}{2}$
Length of Rope to Allow in Feet.....						
Standard Short Splice...	15	20	24	28	32	36
Long Splice	30	40	50	60	70	80

This process should be continued with the first strand from each rope end until only strand equal to the length of tuck remains.

The length of tuck is approximately one-twelfth the amount of rope allowed for the splice. (See table on next page.)

The second strand from each rope end should be unlaid and replaced by a strand from the other rope end in the same manner, but stopped at a distance of twice the length of tuck from the point where the first pair of strands protrude. In a similar manner, the third strand from each end should be replaced by a strand from the other end for a distance equal to the length of tuck.



Fig. 19

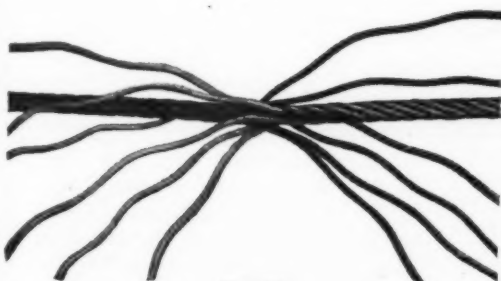


Fig. 20



Fig. 21



Fig. 22

Place a seizing on each of the two rope ends to be spliced together at a distance from the end equal to one-half the allowance for splicing. As an example, if splicing two lengths of $\frac{1}{2}$ inch diameter rope together by the Standard Short Splice, the seizings would be placed ten feet from the ends.

Unlay the strands of each end to these seizings. See Fig. 19.

Cut off the hemp centers as near the seizings as possible.

Interlock the six strands of each end in a finger lock position. Force the ends together so that selplings are as near each other as possible. Remove the seizings. See Fig. 20.

Unlay one strand, filling the groove vacated by this strand with a strand from the other rope end. Fig. 21 shows the first strand from each rope end being replaced by a strand from the other rope end.



Fig. 23



Fig. 24



Fig. 25



Fig. 26

ROPE SIZE AND LENGTH OF TUCK

Diameter of Wire Rope in Inches.....	$\frac{1}{4}$ - $\frac{3}{8}$	$\frac{1}{2}$ - $\frac{5}{8}$	$\frac{3}{4}$ - 1	$1\frac{1}{4}$ - $1\frac{1}{2}$	$1\frac{3}{4}$ - 2	$2\frac{1}{4}$ - 3
Length of Tuck in { Standard Short Splice... 15	20	24	28	32	36	40
Inches..... { Long Splice 30	40	50	60	70	80	90

The twelve strands now protrude from the rope in pairs at points separated by twice the length of tuck.

The protruding strand ends should next be cut off leaving lengths equal to the length of tuck. Fig. 22 shows two of the six pairs of strand ends.

The strand ends of preformed wire ropes should be straightened. It is not necessary to straighten the strand ends of non-preformed ropes. With this exception the method of splicing is the same for both.

The strand ends should be wrapped with friction tape or twine. A layer of tape or twine helps hold the tucked ends in place as it makes them larger in diameter and increases the binding action of the outer strands. It is advisable to build up the diameter of the strand ends with tape or twine as much as possible without making the rope oversize when the strand ends are tucked.

The method of tucking the six pairs of strand ends is the same for each pair.

If a vise is available, it should be used as it facilitates the tucking operation. If a vise cannot be obtained, a manila rope sling and a short wooden lever may be used to untwist and open the rope.

Place the rope in the vise so that the vise grips the rope and one of the two strand ends just beyond the point where a pair of strand ends protrude from the rope. See Fig. 23. Drive marlin spike under three strands, opening the rope so that the hemp center may be cut and the end pulled through the opening made by the point of the marlin spike. Start the wrapped strand end into the space left vacant by the removal of the hemp center. Rotate the marlin spike so as to force out the hemp center and force the strand end into the center of the rope.

By rotating the spike, the strand end is tucked its entire length. See Fig. 24.

The rope is then regripped in the vise so that the second strand end can be tucked. See Fig. 25.

Drive the marlin spike under three strands as before.

In order to start the second strand end into the rope without any slack, a pair of splicing tongs or some other form of clamp should be used to force this strand into its proper position. See Fig. 25.

The marlin spike is then rotated forcing the hemp center from the rope and forcing the wrapped strand end into the space vacated by the hemp center. The strand end is tucked its entire length in this manner. See Fig. 26.

When splicing regular lay ropes the strand ends should not cross at the point where the tucks begin. See Figs. 26, 27 and 28.

When splicing Lang lay ropes, it is advisable to have the strand ends cross at the points where the tucks begin, as this increases the holding power of the splice. This is accomplished by inserting the marlin spike under the strand end which has been tucked when starting the tucking operation on the second strand end.

The rope will be somewhat deformed at the point where the tucks start. This can be remedied by hammering the rope at this point with wooden mallets. See Fig. 27.

Fig. 28 shows one of six similar points of the finished splice where one pair of tucked strands start. A rope spliced in this manner is nearly as strong as the original rope. After running a few days, a well made splice cannot be detected except by a careful examination of the rope.

Directions for Splicing 8 Strand Ropes

Because the hemp center in an eight strand rope is so much greater in diameter than the strands, it is not practical to tuck the strand ends by the method outlined for splicing six strand ropes. The strand ends are secured by twisting or tying them together. This is known as the Nash Tuck.

The process for splicing together two similar eight strand ropes, or splicing an eight strand rope endless,

is similar to that for splicing a six strand rope up to the point where the strands are to be tucked. See Fig. 22. The only difference is that the length of tuck is approximately one sixteenth the amount of rope allowed for splicing.

The method of tucking the eight pairs of strand ends is the same for each pair.

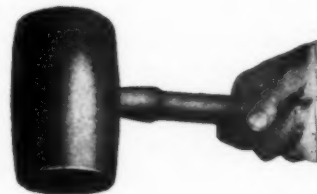


Fig. 27



Fig. 28



Fig. 29



Fig. 30

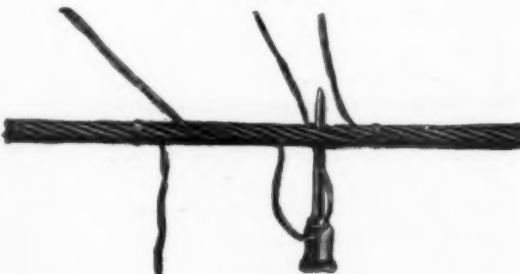


Fig. 31



Fig. 32

Place seizings on rope each side of point where the strands project. Split the strand ends in two back to the seizings. See Fig. 29.

Take one-half of each strand end and tie a double knot. See Fig. 30.

Knot should be drawn down tight by a hand clamp or some similar tool.

Insert spike under the three strands beyond the knot and pull the half strands through. Fig. 31 shows one-half strand pulled through and the second half strand in the process of being pulled through.

The two half strands which have been tied and tucked are cut off close to the rope and each short end forced into the valley between the strands.

The other two half strands are tucked by inserting a marlin spike under the adjacent strand and pulling the half strand through. The ends are then cut off close to the rope and the short ends forced into the valleys between the strands.

Any unevenness in the rope should be removed by hammering with wooden mallets in the manner shown by Fig. 27.

Fig. 32 shows one of eight similar points of the finished splice.

Truck Economies Urged by Office of Defense Transportation

The Office of Defense Transportation late in December offered truck and passenger car owners three suggestions for the maintenance of their vehicles.

If followed, the ODT said, these suggestions will help ease the strain which is steadily being placed upon the dwindling supply of automotive mechanics and upon replacement parts available for repairs to civilian vehicles. The suggestions are:

1. Put unessential repairs off until after the war. Make only those repairs which are necessary to the safe operation of your vehicle, as well as those which will prolong its mechanical life.

2. Have essential repairs made as early as possible. Prompt repair to an ailing gear or bearing will help conserve parts and mechanics' time later.

3. Don't waste gasoline and rubber driving around trying to find a repair shop that can make your repairs immediately. Make your inquiries by telephone.

Neither the manpower nor the supplies can any longer be spared to repair bent fenders, replace radiator grilles or do other unnecessary re-

pair work, the ODT said. At the same time, vehicle owners were urged to practice "preventive maintenance" by having necessary mechanical repairs made as soon as possible.

If a minor mechanical repair, which would take only a few moments of a mechanic's time, is neglected, the resulting major breakdown may cause the vehicle to be "lost" for the duration because the replacement assembly was not obtainable, it was pointed out.

Particular care should be taken to keep the vehicle properly lubricated. A large proportion of major assembly breakdowns are due to neglect of lubrication. Similar preventive maintenance practices—rotation of tires, periodic battery inspection, change of air cleaner bath, etc.—which can be handled by filling station attendants, should be cultivated.

That proper maintenance of the country's motor transportation facilities is squarely up to the vehicle owners, was the closing emphasis of the ODT.

Common Causes of Wire Rope Failures

Of the many forms of abuse of wire ropes, the most commonly encountered are:

Ropes of incorrect size, construction, or grade.

Ropes allowed to drag over obstacles.

Ropes not properly lubricated.

Ropes operating over sheaves and drums of inadequate size.

Ropes overwinding or crosswinding on drums.

Ropes operating over sheaves and drums out of alignment.

Ropes operating over sheaves and drums with improperly fitting grooves or broken flanges.

Ropes permitted to jump sheaves.

Ropes subjected to moisture or acid fumes.

Ropes with improperly attached fittings.

Ropes permitted to untwist.

Ropes subjected to excessive heat.

Ropes kinked.

Ropes subjected to severe overloads due to inefficient operation.

Ropes destroyed by internal wear caused by grit penetrating between strands and wires.

The foregoing is from "Valuable Facts about the Use and Care of Wire Rope," published by American Steel and Wire Co., Rockefeller Bldg., Cleveland, Ohio.

Specify WGB CLAROFIERS for Servicing Without Tools



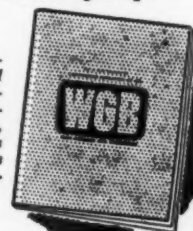
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KINGSTON, N. Y.

Oil Filters—How They Save Engine Wear; Pointers in Their Selection and Use

By W. G. BURHANS

President of W.G.B. Oil Clarifier, Inc.,
and Inventor of The W.G.B. Clarifier

Practically all construction machinery depends for power on Diesel or gasoline engines. These engines are utterly dependent on efficient lubrication systems.

Every vital point in a Diesel or gasoline engine is kept alive only by an abundant supply of lubricant. To insure lubrication, a thoroughly filtered oil supply must be carried in the crankcase and circulated to all vital parts. This oil and its lubricating system must be efficient and clean to insure adequate lubrication to those vital parts at all temperatures, and positions of equipment.

Causes and Control of Engine Wear

If perfect lubrication could be achieved in an internal combustion engine, wear would not take place. However, we do know that engines wear out and with varying degrees of rapidity—proving that the factors which cause engine wear can be controlled. Here is a list of the causes of engine wear in their approximate or usual order of importance.

1. Abrasion due to metallic and hard carbon particles in the oil.
2. Metal on metal scuffing when the engine is started.
3. Occasional oil film rupture in the running engine.
4. Acid erosion.

And here is a short answer to the control of each:

1/ Foreign particles build up into aggregation of carbon, metallic, and asphaltic compounds until they are larger than the bearing clearances which are in scant thousandths of an inch. When these growing particles are pumped into the bearing they bind and scratch the delicately machined surfaces. A good cartridge filter, by maintaining color-clear oil, can and does eliminate the largest cause of all engine wear. Fleet owners report an average of doubled life—doubled time between overhauls—on their protected units.

2/ In cold weather starting, a period of from three to ten minutes is required before ample oil reaches the

top piston rings. During this period, there is only partial lubrication of rubbing surfaces and wear ensues. This wear can be noticeably reduced by the use of appropriate low viscosity oils. However, any oil flows more freely to the most distant wear points, arrives more quickly and gives better protection sooner, if it has been clarified so as to be free of water and viscous sludges.

3. Regardless of whether light or heavy oil is used, the high unit pressure of piston rings and bearings will cause them to rupture the oil film periodically especially at low engine speeds. It can be demonstrated that clarified oils, free from water, excessive dilution and sludges, stretch a protective film over a greater area and stand more pressure than unfiltered oil.

4. When water is eliminated from the crankcase, much of the acid escape is in volatile form through the breather pipe before water can fix the acid in the oil. In addition, the absorption ability of a good filter maintains the acidity at a safe minimum. When the proper size and type of filter is correctly installed and serviced most of the acids which form as impurities in the crankcase oil are removed. To be explicit, the acidity is maintained at what the engineering world considers to be a safe minimum.

Some Practical Rules for Lubrication

Due to constant improvement in oils and engines it is difficult to say just how much the proper filter can add to the life of an engine. Figures of double and triple engine life are reported but the average figure is closer to fifty per cent increase in hours or miles between overhaul with less extensive parts replacement even then.

Here are a few suggestions, based on years of experience with thousands of engines:

1. Use good oil; the best obtainable is also the cheapest. The slight extra cost is more than offset by the decreased consumption and better en-

gine service. Cheap oils are apt to be heavy sludging oils.

2. Check accessories periodically—maintain ignition and carburetor in top condition.

3. Tighten cylinder heads periodically with a gauged wrench. Replace gaskets whenever necessary. This helps to maintain compression and prevents the seepage of water into the crankcase oil; if the oil used has excessive amounts of sulphurous compounds even small amounts of water may cause a serious sludging condition. Water also increases the acid strength of the oil.

4. Change filter cartridges as soon as the oil starts to darken. As the oil blackens the rate of contamination goes steadily higher. Only clean oil can be kept clean. If the engine runs until the oil is very black, the replacement cartridge has to clean up the engine and nothing has been gained. If cartridges are replaced promptly they are easier to change as the asphaltines have not had time to jell. Prompt cartridge changes also hold down the acidity of the oil to a lower value.

5. Avoid mixing different brands of oil between oil changes. In general, mixing one 100% Pennsylvania oil with another or with a high grade paraffin base oil will not do any harm. However, oils are refined by widely different processes and from greatly varying crudes which are chemically different. The mixing of two different brands of oil can produce an oil that is inferior to both. Such mixing in the engine may result in accelerated sludging, shorter filter cartridge life, and increased oil consumption.

Considerations in Selecting Oil Filters

There are so many makes of replaceable cartridge filters on the market today that the operator may be confused in making his selection. The previous paragraphs on the operation and service of a good filter would, however, limit the intelligent choice to a few makes. It so happens that on several different types of tests, different filters perform more or less efficiently. Of the good makes of filters on the market, one may be outstanding for your particular type of operation. It is suggested that you try several standard brands in actual operation on your fleet for comparison purposes. Exercise the following points of caution in your selection:

1. Buy a standard brand made by a reputable maker.
2. Select a unit that is both rugged

and simple in design. The chief mechanical trouble will be found in cover leakage. Avoid filters which have many loose parts which could be lost or incorrectly replaced.

3. Look for a balance between initial cost and service cost. Some filter manufacturers disarm the operator with a low initial cost then charge excessive prices for the elements. Unless the filter is to go on a low mileage operation, this filter may have a high over-all cost. In reality the purchase price is only a down payment, and an additional payment on the filter proper is included in the cost of each refill. Neither is it wise to purchase a filter simply because it is cheap. It is estimated that the cost of labor for cartridge replacement is 35c. Therefore a cheap, inefficient cartridge carries with it the extra labor costs of frequent changes. Avoid substitute cartridges or elements.

4. Don't judge performance by the amount of dirt caught in the filter. Certain filter manufacturers point with pride to cartridges plugged solid with a black viscous material and claim their units hold more dirt than other makes. Frankly, any loosely packed material of fair filtering ability will collect a lot of "dirt." However, such units are often indirectly responsible for much of the dirt they collect. For, as the solid content of working oil builds up, the oil tends to oxidize more rapidly and to form sludges. An efficient filter, by keeping the oil in better condition, actually has less work to do, less dirt to trap. Witness the old cloth and felt types of cleanable filters used in past years. Even when cleaned daily they were always found in a dirty condition.

After the make or type of filter has been decided on, size or capacity must be taken into consideration. Many engine manufacturers because of limited space, price competition and other problems, are inclined to install filters of insufficient capacity for the heavy duty operator. Filter salesmen in a hurry to get an order are prone to sell the cheapest—or smallest—filter rather than the correct one. A filter too small for its task will give limited benefits and will cost more to operate. A heavy duty unit more than saves the extra initial cost through lower upkeep. Tests prove that doubling the filter size shows a cartridge life much more than doubled. Since cartridge costs do not increase proportionately with the size, a definite saving is made by using oversize or heavy duty filters for long mileage or severe service operations.

Conclusion

The increase in compression ratios, power outputs and engine revolutions of modern engines places increasing burdens on the oil filter. This has been partly offset through improvement of lubricating oils. In the case of Diesels, present engines require two or three times the filtration of equivalent size gasoline engines. Current engine designs call for closely held tolerances. Common sense requires that these tolerances be maintained.

If you have been too busy and your equipment is not properly protected, equip at once with a well-built, efficient filter of ample size. On future equipment purchases, request that the manufacturer install the make of filter which you are now using or plan to adopt as your standard operation equipment.

It is not enough that oil be clean when poured into an engine. It must be kept clean while in use. This is essential to the life of the engine. The oil filter removes dirt, dust, grit, metallic sediment, and sludge from the oil before it can reach the working parts of the engine. This makes

for better lubrication economy, saves critical materials, keeps equipment on job longer, saves man-hours, and does more work at the minimum cost per mile.

Bituminous Transfer Pumps Save Material

When transportation systems are taxed to the limit, it becomes necessary to increase the storage of bituminous materials on some jobs, in order to eliminate costly delays.

This often involves the necessity of a bituminous power driven transfer pump attached to or near the storage tank. In some cases where the material is brought to the storage yard by trailer tank, it may not be equipped with a power driven pump; therefore, a pump must be available in the storage yard to empty the tank truck and raise the material up to the elevated storage tank. In the case of emergency where supply tanks or spraying outfits find it impossible to get rid of their load, the transfer pump must empty these tanks, especially if they are not equipped with heating units. *From the Elbee Tatler.*

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Road and Street Castings

Write for Catalogs

How To Lengthen Hose Life

Lucky is the job or shop today which is well supplied with rubber hose. You don't realize how indispensable your hose supply is until you start running short.

What can be done to make hose give longer service? Here are several tips from United States Rubber Company's new instruction book, "*First Aid to Industry*," which incidentally is available free on request to this firm's office, Rockefeller Center, New York:

Order right type hose. Sometimes there is a temptation to order hose with several more plies than are recommended, with the idea that this will provide a safety factor and increase service life. Quite often the reverse is true. The hose will be harder to handle than it should be and when the final score is in, actual life may be even shorter than that of the right hose.

Always try to use the proper type and size of coupling or clamp. And



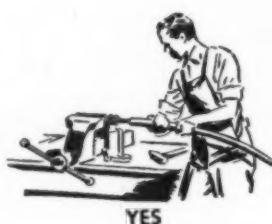
avoid ordering special hose with rigid tolerances. It is slow and wasteful to grind hose to a special outside diameter to fit a special coupling. You can usually change the size of the fitting or attachment so that it will be adaptable to standard hose. This will save trouble, delay, and expense every time the hose is changed.

Avoid sharp bends. Sometimes hose is murdered young by being bent in a small arc close to the fitting. Large heavy hose can be saved this abuse by careful installation and use.

Unpack carefully. When you receive a shipment of hose you will find that it has been carefully packed by experts so that it will reach you in top condition. Unpack it carefully too. If you do, it will start its job in the same fine condition it left the factory. The most unkindest cut of all is one inflicted on a new piece of hose by a grab hook, knife, pinch bar, or chain before it so much as has a chance to start on the important job ahead of it.

Store in cool, dry, dark place. Like

all other rubber products, hose gets along best stored in a place away from sunlight, heat, and ozone. Pick your mechanical rubber storeroom in a spot removed from generators, electric motors, boilers, and steam pipes. Hose with fabric covers will mildew if kept in damp, musty places. Mil-



dew works fast, saps the strength right out of hose.

Store coils flat. Always coil hose on a floor, if it is dry, or on a shelf or other flat surface. If you hang it on nails, hooks, or brackets you will strain and weaken it.

Shut off at intake, not nozzle. Satisfy yourself that valves are provided at the intake end of all the hose lines so that the flow of material through the hose can be stopped at that point. Most hose is designed to stand up to the strains involved in the normal passage of substances through it. Shutting off this flow by kinking the hose or by closing it off at the dis-



charge end often causes premature breakdown and failure of a healthy piece of hose.

Use correct couplings for the job. Have all couplings carefully inspected before installation to see that burrs, serrations, and other sharp edges are not present. If they are they should

be carefully smoothed off with a file. Cuts and gouges in hose tubes usually don't show up right away. But they always reduce service, often quite seriously.

It pays to standardize on modern type couplings, in preference to the old style nipples and brass fittings formerly used. Modern couplings do not injure air hose and they can be used over and over again.

Where couplings are tight-fitting, soap or rubber cement can be used as



safe lubricants. Never use grease and never ream out the hose to accommodate the fitting. Place the coupling in a vise and force the hose straight over the sleeve. Never drive the coupling in with a hammer or mallet.

Seat or socket type couplings require that the hose be absolutely square on the ends. Otherwise fluid can leak in between the outer and inner sleeves and wick its way into the carcass of the hose. This can make the highest quality hose fall apart from adhesion breakdown.

This same wicking trouble is sometimes encountered where materials are being conducted through a hose which is submerged in a liquid. Hose for such service should be ordered with special rubber capped ends to guard against damage.

Special Notes on Water Hose

Contractors are used to slamming water hose around and writing off large footages on each job, but "them

days is gone forever" or at least for the duration. U. S. Rubber makes these suggestions:

See that water hose is provided in an ample length for the job it has to do. Stretching hose to make it reach, really shortens it . . . in service life. Bending, kinking, or dragging such

hose over rough surfaces and allowing it to be crushed are practices which can be avoided with a little care.

Provide facilities so that water can be cut off at the intake end of the hose rather than at the discharge end. If the hose is being used out on a job, it will pay to provide some kind of reel device on which it can be wound and stored in a protected location. It should be drained after use and put away where sun and weather cannot attack it. Never leave a hose where water might freeze inside it.

How To Secure More and Longer Sprocket Service

Getting more and longer wear from your tractor's sprockets and other wearing parts is an important consideration nowadays. In most cases, your chance of getting replacements promptly are about the same as that of holding thirteen spades or a Royal Flush. Following suggestions for building up and hard facing sprockets for maximum wear are given by the American Manganese Steel Division of the American Brake Shoe & Foundry Company. The hard-facing rod covered here is the Amsco Economy.

1. Remove all laminated or mushroomed metal from the worn sprocket teeth.
2. Provide a metal template to indicate the contour of the teeth on the built-up sprocket wheel, including enough metal to maintain uniform pitch.
3. Build up both sides of the teeth with a high carbon or low alloy electrode to within $\frac{1}{8}$ in. of template size, and over this deposit apply one layer of hard-facing weld metal to fit the template. This will provide the hard, abrasion-resistant surface necessary for wear resistance.
4. The proper tooth contour can be acquired by simply grinding or other finishing operations. The manufacturers of this hard-facing metal state that it polishes in service and on this account galling and seizing are reduced to a minimum, while service is increased.

Shown is a crawler tractor sprocket wheel that has already been built up



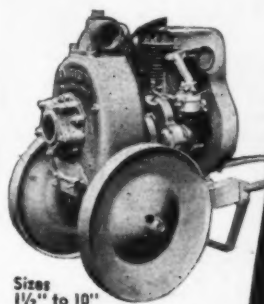
three times in the manner above described. Each rebuilding gave nearly twice the service of a new sprocket wheel under the severe conditions found in construction grading. That adds up to six times the service given by a new part, and further reclamation is possible.

Good Practice for Handling Friction Materials

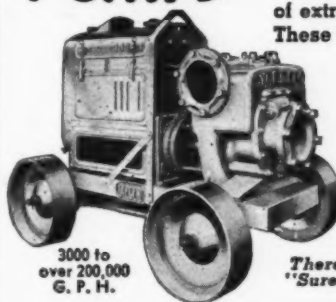
"Good Operating Practices," a pamphlet issued by Johns-Manville, of New York City, contains the following section on friction materials.

How to Make Brake Linings Last Longer

1. The capacity of any clutch or brake is its ability to dissipate heat. Heat is best disposed of by convection—take every possible means of increasing air flow around clutches and brakes to get rid of heat.
2. Guard against high temperature in brakes or clutches as it may cause:
 - a. Wide variation in friction
 - b. Rapid wear of friction material
 - c. Possible scoring of metal surface
 - d. Possible heat checking of metal surface
 - e. Failure of bearings.
3. Do not use oil, clay or other foreign substances on friction material surfaces in order to control friction. Widely fluctuating brake action will result and probably necessitate lining replacement.
4. Be sure brakes and clutches are properly adjusted. Unequal adjust-



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offer you factory-tested and certified high performance in units of extra heavy duty construction. These pumps are the surest protection your money can buy against pump breakdowns and job delays, the best insurance the contractor can have against the cost and uncertainty of early replacement.

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ment causes unequal wear and inefficient and noisy operation.

5. True up badly scored or heat-checked rims with whetstone if portable grinders or other equipment are not available. Rims in this condition can cause rapid wear of friction materials.

6. Check bands for being out of round or kinked when relining. Such conditions create local high pressure areas, rapid wear, excessive heating, noisy operation, and short life.

7. Bear in mind that increasing the width of a brake does not increase its braking capacity. It simply reduces unit pressure and the brake lining lasts longer.

8. Greater brake capacity can be provided by increasing diameters or torque arm, or total pressure.

Sand and Gravel Production in 1942.—All-time high sales records were set in 1942 on sales of sand, gravel and crushed stone, according to a preliminary announcement by the Office of War Information. Cement sales increased 10 per cent, sand and gravel were up 7 per cent and crushed stone about 9 per cent.

Don't Scrap it - WELD IT

It's patriotic, as well as good business, to repair parts instead of scrapping them. By salvaging tractor parts, buckets, dipper teeth, frogs, crossings—roll, gyratory, jaw crushers, you take one more load off plants doing war work.

Repair your broken and worn parts with Manganal—it's the easy, quick and efficient way. Manganal alloy steel welding, wedge bars and shapes give new lives to old parts.

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NEWARK, N.J.



How To Save Welding Rod

The tremendous waste of welding rod annually is pointed out by Bob Wagner, editor of *Hobart Arc Welding News*, whose further reminders apply to the road field as well as to industrial or job welding shops.

Welding electrodes are scarce. Raw materials used in the manufacture of welding rod, including chromium, nickel, molybdenum, cellulose, titanium, oxides and aluminum are needed urgently in our war effort.

It's easy to comprehend that wasting electrodes is a serious hindrance to our war effort. But most of the waste can be corrected by the welding operators themselves—and here's how it can be done:

RULE 1—Never throw away a stub end longer than 1½ in. Many stub ends are thrown away before the electrode has been utilized fully. Often a welder starting a new joint will throw away a long stub end and start with a fresh electrode, so that he can do the entire job without interrupting his work by changing electrodes. Electrodes should not be burned back, however, to where the coating tapers off, as this will tend to injure weld quality.

RULE 2—Never produce fillet welds with an excessive convex or concave face. The finished surface of each weld should be smooth, regular, and a trifle convex. Excessive convexity is not a reinforcement for the joint, but a waste of weld metal—many times causing an undesirable concentration of stresses. On the other hand, excessive concavity produces a weak joint unless the fillet is greatly oversize.

RULE 3—Do not bend electrodes. There is no important reason for bending any electrode. The flux coating on the bent portion will crack and render this portion useless. Four bent electrodes will produce only as much weld metal as three straight.

RULE 4—Take care in fit-up. Laboratory tests show that welding electrodes will penetrate the metal being welded about 3/32 in. Therefore, full throat size and strength can be produced when the gap in the fit-up is as much as 3/32 in. This means that a joint up to 3/32 in. will require a minimum amount of welding material and produce a full strength weld. When the gap exceeds 3/32 in., excess metal must be deposited to make a strong joint. (This operation may only amount to a few cents or a fraction of a cent in one work piece, but it adds up.)

RULE 5—Select the right type of joint. Although this selection is usually made by welding engineers in major welding projects, thousands of small shops can save time and money

also by analyzing the work for proper selection of joints. A joint should be selected that meets requirements for the welded product—carrying its load with a minimum amount of weld metal that can be produced with the greatest possible speed for efficiency.

RULE 6—Use the largest size electrode possible for desired results. For example, it requires roughly about half the time to deposit a pound of weld metal from ¼-in. coated mild steel electrodes as from 3/16-in. electrodes of the same type. This is due to the fact that the larger size permits the use of higher current, and necessitates fewer stops to change electrodes, since only about two-thirds as many ¼-in. electrodes must be used to obtain a pound of weld metal as compared with the same amount of 3/16-in. electrodes.

RULE 7—Run the minimum number of beads to meet design requirements. Excessive number of beads is merely waste metal.

RULE 8—Choose electrodes that meet the requirements of the job and can be produced at the lowest possible cost. Follow the welding procedures recommended by electrode manufacturers.

RULE 9—Keep electrodes dry. When electrodes are permitted to get soaking wet, they are ruined. Make certain, especially on out-of-doors jobs, that a dry storage space is provided for electrodes.

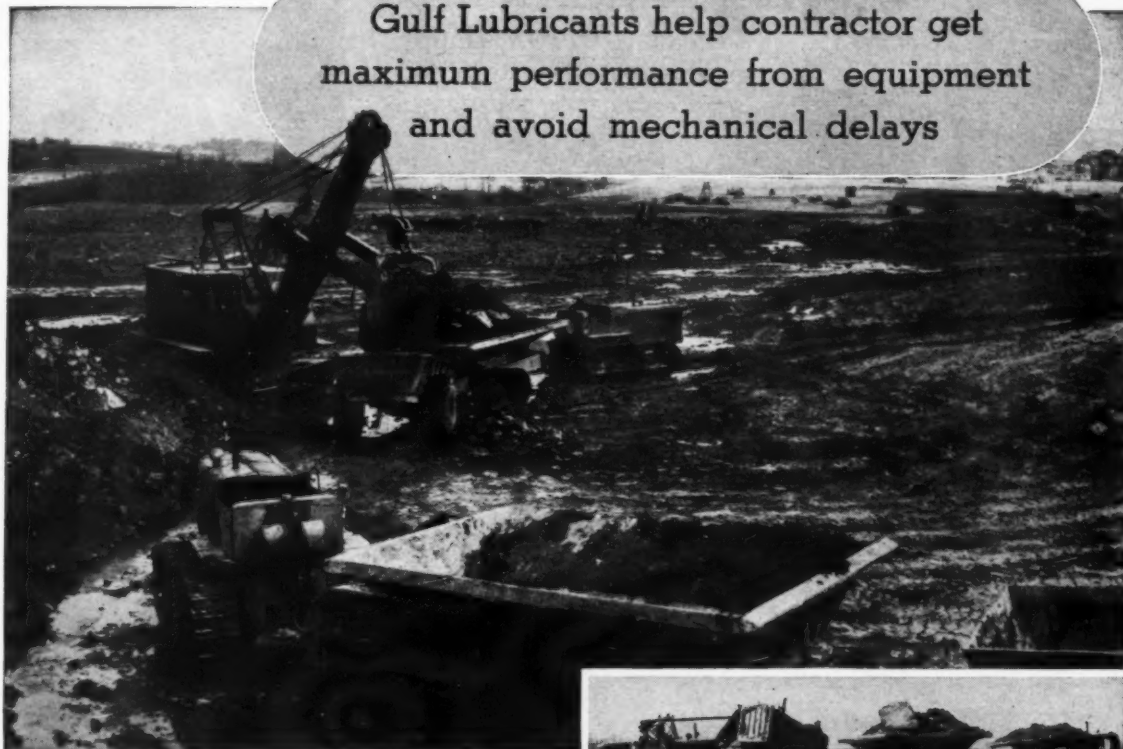
Clamshell Lips Built Up with Strips of Old Grader Blade . . .

The accompanying snapshot shows one of many welding jobs that have been done by the shop crew of N. M. Isabella, paving contractor of Madison, Wisc. The badly-worn cutting lips of this clam bucket were restored by welding on strips of hard steel from a discarded grader blade.



Huge airport project 3 months ahead of schedule —

Gulf Lubricants help contractor get
maximum performance from equipment
and avoid mechanical delays



*Ralph Myers Construction Company, Salem, Indiana, is three months ahead of schedule on a huge military airport project, located in Western Pennsylvania. The \$2,500,000 contract involves moving 5,000,000 cubic yards of earth and rock. Gulf quality lubricants are helping this contractor get efficient, trouble-free performance from the many units of modern equipment employed.



“OUR equipment has made an exceptional performance record on this job with Gulf lubricants in service—one of the important reasons we are months ahead of schedule,” says airport project contractor.* “Proper lubrication has helped us get the most out of each unit and avoid unnecessary operating delays — which means more dirt moved on every shift.”

Now that spare parts and new equipment are so difficult to obtain, many leading contractors use Gulf products as job insurance. For they have learned from experience that Gulf quality lubricants provide an extra margin of protection

against breakdowns and mechanical troubles—and that Gulf quality motor fuels help them obtain more efficient performance from their equipment.

You, too, will find it pays to use Gulf quality products on your next contract. They are quickly available to you through more than 1200 warehouses located in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.



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V. G. Iden Resigns from American Institute of Steel Construction

V. G. Iden has resigned as secretary of the American Institute of Steel Construction, 101 Park Avenue, New York, to accept the position of Industrial Editor of the Bureau of National Affairs, 2201 M Street, N. W., Washington, D. C. David Lawrence, Washington correspondent and editor of the United States News, is president of the Bureau of National Affairs. Mr. Iden became connected with the American Institute of Steel Construction in 1928 as director of public relations. In 1933 he became secretary of the Institute.

Stresses in Corners of Concrete Slabs

Stresses in the corner regions of concrete pavement slabs now may be calculated by means of a relatively simple working formula, which is believed adequate for design use. This formula, developed by M. G. Spangler, Research Associate Professor of Civil Engineering, Iowa State College, is presented in Bulletin 157 of the Iowa Engineering Experiment Station, "Stresses in the Corner Region of Concrete Pavements."

The bulletin presents a brief discussion of other research studies on concrete pavement stresses, including the Bates road tests, the Westergaard analyses, and the Arlington tests by U. S. Public Roads Administration.

In the work conducted by the Iowa Engineering Experiment Station, observations were made of the strains in the top surface of a number of experimental concrete pavement slabs constructed in the laboratory. Measurements also were made of the pressure between the slabs and the subgrade, and of the deflection of the slabs, enabling calculation of the modulus of subgrade reaction.

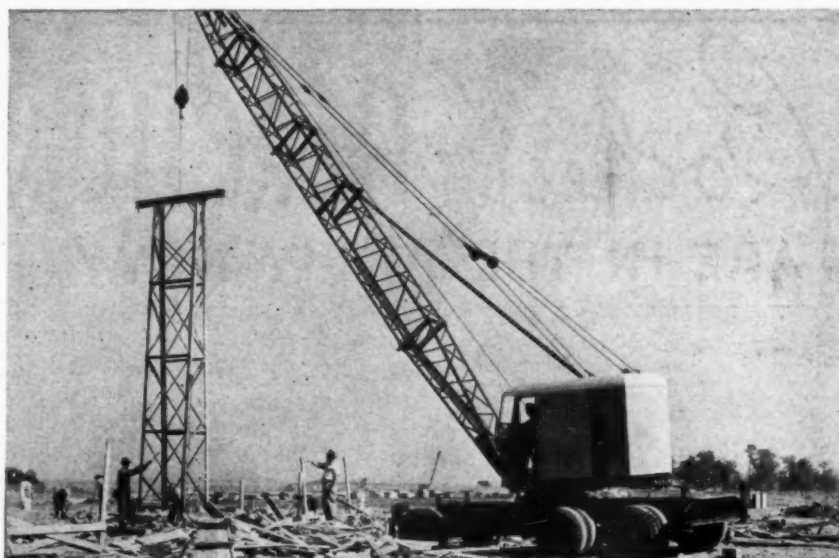
After the measurements were completed the slab corners were loaded to failure. Observations of the size and shape of broken corners of actual pavements were made, and, together with the laboratory strain measurements, and the results of the Arlington tests conducted by the U. S. Public Roads Administration, led to the development of the working formula for corner load stresses.

As a result of the laboratory stress measurements and field observations, Professor Spangler concluded that the locus of maximum stress in the corner region of a concrete slab when loaded at the corner is a curved line

which bends toward the corners as it approaches the edges of the slab, and that maximum stress is not distributed uniformly along this line but is greater at the bisector and smaller at the edges of the slab. Spangler also observed that the magnitude of stress in the corner region is dependent upon the position of the center of gravity of the corner load. The modulus of subgrade reaction is not a single-valued constant for all points in the corner region but is considerably greater at the corner than at points back in the slab.

Professor Spangler made an informal survey and study of the service behavior of two sections of concrete pavement near Ames, Iowa. He made an analysis of the corner breakage of these two sections, and calculated the thickness of pavement which would have been required to carry heavy traffic for a long time without excessive corner breakage.

Single copies of this 96-page bulletin may be obtained without charge from the Iowa Engineering Experiment Station, Iowa State College, Ames, Ia.



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THE GENERAL EXCAVATOR COMPANY, Marion, Ohio

Additional Information on the Plain Concrete Arch Near Frankfort, Indiana

The December issue of *ROADS AND STREETS* contained a brief but highly illuminating article on unreinforced concrete arches, with a special reference to the arch now under construction on Indiana State Road No. 75 north of Frankfort. Mr. Charles R. Ruminer, Supervising Engineer, Bridge Design Department, State Highway Commission of Indiana was the author.

Since publication of that article

additional information has been received, giving stresses and other important data on the arch near Frankfort. These data are given herewith.

Maximum Stresses

Compression—1000 lbs. per sq. in.
Tension—zero.

As wings, abutments, and spandrel walls are gravity type, with the base or any section being 100% effective, the compressive stresses in the con-

crete are relatively low. And naturally with a 100% effective section there is no tension.

The arch ring was shaped so that in the analysis the resultant would not be outside the middle $\frac{1}{8}$, at any point, thereby keeping the ring in compression throughout its entire length. The maximum compressive stress, at the crown, with H-20 live load is 350 lbs. per sq. inch.

Arch Thrusts

The arch ring thrusts at skewbacks (per ft. width of arch ring) are:

Dead Load Only—Horizontal—	\$1,250 lb.
Vertical	—39,300 lb.
Dead Load & Live Load (L.L.=125 lb. per sq. ft.)	
Horizontal—	36,150 lb.
Vertical	—43,350 lb.

General Specifications for Concrete

Footings, abutments, and wing walls are of Class "E" concrete, which is required to contain not less than 1.25 barrels of cement per cu. yd. nor more than 7 gallons of water per sack of cement.

Arch ring, spandrel walls, and handrail are of Class "D" concrete, which is required to contain not less than 1.5 barrels of cement per cu. yd. nor more than 6 gallons of water per sack of cement.

It is expected that the bridge will be open for traffic about May 15, 1943.

American Rubber Mission to Russia


The American Rubber Mission to the Soviet Union, appointed by William M. Jeffers, Rubber Director, to investigate the Russian synthetic rubber industry, has left by plane for Moscow.

Members of the Mission are Ernest W. Pittman, president of Interchemical Corp., chairman; Dr. W. A. Gibbons, head of general development, United States Rubber Co., representing all American rubber and synthetic rubber manufacturers; Dr. Aristide Von Grosse, scientist of Columbia University, who has lived in Russia and will also act as interpreter; and Irvin L. Murray, chemical engineer of Carbide and Carbon Chemicals Corp.

The Mission will require several months and will investigate all aspects of synthetic rubber manufacture in Russia where it has been a large industry for some years. It is expected that the Russians in return will send a similar mission to investigate American techniques and processes for the manufacture of buna-S.

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A WARTIME MESSAGE

To Highway Officials and Engineers!



THE same principles of wartime conservation, that civilians practice with their automobiles and tires, apply with equal urgency in the matter of the nation's highways.

This year's needs are not for pioneering new routes or building new cross-country highways, but rather for protecting and saving what we've got—for dependable and economical maintenance that will preserve the three million miles of existing roads that are the world's greatest highway system.

We Americans know from experience that poor roads save no one money. There is no calculating what they cost in excessive wear to tires and automobiles, in delays to vital transportation and in lost opportunities. They do not contribute to winning the war, and they have no place in America's victory program.

For these reasons, as well as to protect the investments in the roads themselves, highway engineers and road officials are advised to concentrate much of their efforts upon maintenance for 1943.

If your own budget seems inadequate for all it must accomplish, remember there is a right type Tarvia and a right Tarvia method for almost every type of highway maintenance and repair. The Tarvia field man, backed by Barrett's 37 years of paving experience, will be glad to suggest quick and economical ways Tarvia can be used to provide the most miles of good roads for wartime travel.



THE BARRETT DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK

ONE OF AMERICA'S GREAT BASIC BUSINESSES

*Reg. U. S. Pat. Off.

New York • Chicago • Birmingham • St. Louis • Detroit • Philadelphia • Boston • Providence • Rochester
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ROADS AND STREETS. January, 1943

Minnesota Determines Road Costs Per Mile of Travel

Figure Includes All Outlays for State and Local Roads and Streets

Expenditures for roads and streets in Minnesota average seventy-nine one-hundredths of a cent for each mile traveled in the state by vehicles owned in the state, according to data compiled by the Highway Planning Survey. This figure includes all outlays for construction, maintenance, interest and other current needs, but not debt retirement, for

all state, county and township roads and municipal streets and alleys.

The total net direct expenditures both from road-user taxes and proceeds of property levies, averaged \$51.60 in a typical year, for each vehicle owned in the state. This represents \$24.21 spent by the state on trunk highways, \$15.73 spent by the counties on state aid, county aid

and county roads, and \$11.66 spent by cities, villages and townships for local roads, streets and alleys. Expenditures by local units were not far different in rural and urban areas, being \$12.30 per vehicle in the townships and \$11.30 in all municipalities. The averages differed widely, however, in different sizes of municipalities, as follows:

Incorporated places	Expenditure per vehicle
1,000 or less.....	\$ 3.66
1,001 to 2,500.....	9.28
2,501 to 5,000.....	9.73
5,001 to 10,000.....	16.28
10,001 to 25,000.....	14.92
More than 100,000.....	13.30

All municipalities\$11.30

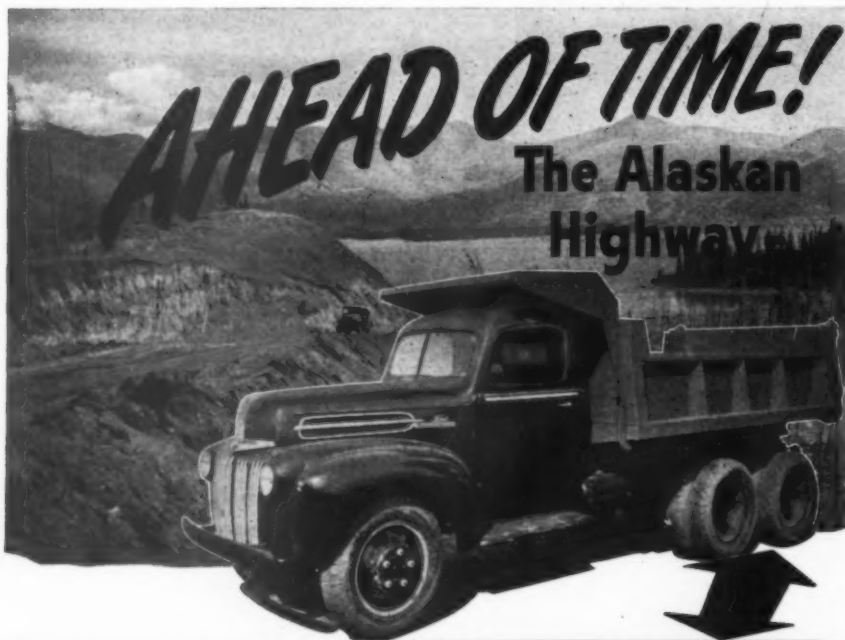
In these figures all aids, grants or other money collected by one unit of government and spent by another unit are included only in the expenditures for the unit making the final outlay. State expenditures were made from receipts from federal aid, motor vehicle taxes, two-thirds of gas taxes, and reserves. County expenditures were made from receipts from county road tax levies, state aid from 1-mill tax and one-third of gas tax, federal aid and other sources. Expenditures by local units were made from receipts from property tax levies, assessments, outside aid and other sources.

Officers of American Association of State Highway Officials for 1943

At the annual meeting of the American Association of State Highway Officials, held Dec. 7-9 at St. Louis, Mo., the following officers were elected for 1943:

President Brady Gentry, Texas; First Vice President, T. C. Frame, Pennsylvania; Vice President, District No. 1, H. A. McDonald, Massachusetts; Vice President, District No. 2, J. A. Anderson, Virginia; Vice President, District No. 3, S. C. Hadden, Indiana; Vice President, District No. 4, R. A. Allen, Nevada; Treasurer, G. H. Henderson, Rhode Island; Executive Committee, C. H. Purcell, California, R. H. Baldock, Oregon, J. S. Williamson, South Carolina, H. E. Sargent, Vermont.

Atlantic States Highway Officials to meet in New York.—The 19th annual meeting of the Association of State Highway Officials of the North Atlantic States will be held on Friday in New York City.



AMERICA'S LIFE LINE TO THE NORTH IS OPEN!—

Operating months ahead of even the stiff schedule set up by Army engineers!

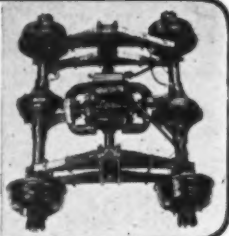
A tough assignment in rough country calling for husky, durable, efficient equipment — and right on the job is a big fleet of trucks with

THORNTON FOUR - REAR - WHEEL DRIVE

By means of THORNTON installations these trucks have been converted from 1½ to 2-ton vehicles into heavy-duty, four-rear-wheel drive trucks handling 6-yard dump bodies.

Standard heavy-duty trucks are not available today—but here is the answer to that problem. You can convert new or used 1½ to 3-ton trucks

Put TWO driving axles under the load instead of one, double the gear speeds, improve springing and load flotation, gain vastly superior tractive ability.

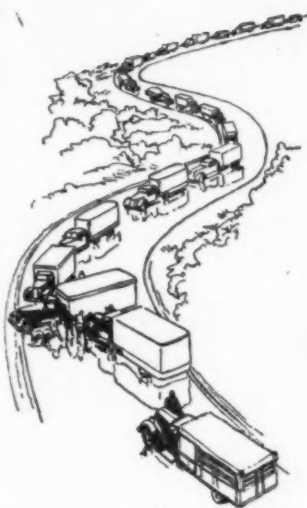
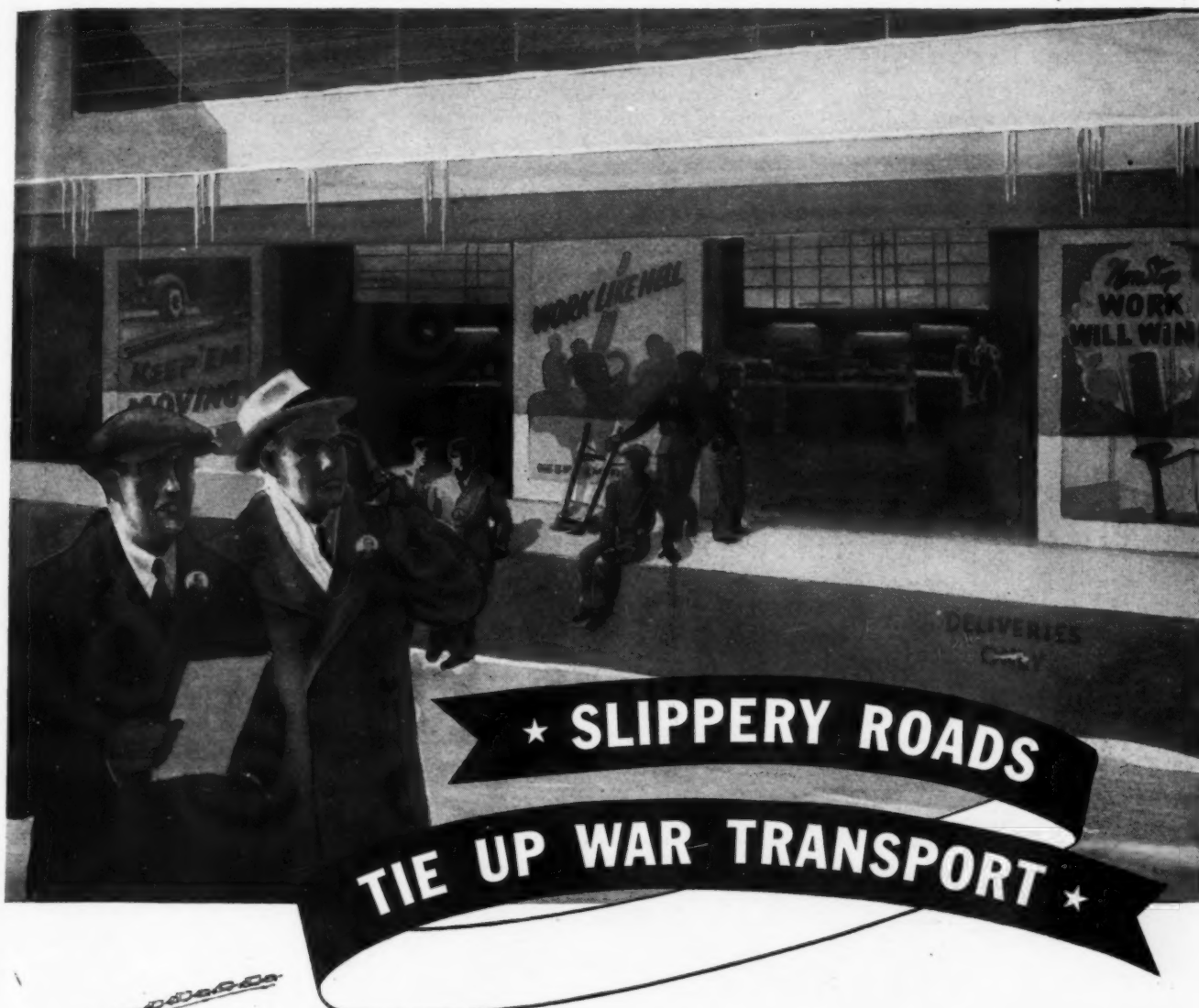


to husky, reliable heavy-duty units of more than twice the capacity. They actually do the job better and cost less.

While Uncle Sam still approves, act quickly! Contact your nearest Truck-stall-THORNTON dealer or wire the factory direct. Trained men will engineer this equipment to suit YOUR OWN PARTICULAR JOB.

THORNTON TANDEM CO.
8721-8779 GRINNELL AVE. DETROIT, MICH.

Manufacturers also of the THORNTON automatic-locking DIFFERENTIAL
"When you need TRACTION you need THORNTON"



Never has the need for skidproofing icy roads been so great as now. Transportation tie-ups due to icy roads are inexcusable this year when delayed production may cost lives. This year, ice control methods must be better—must get into action quicker—must last longer. To achieve these important effects, merely treat your ice control grits with calcium chloride. They will act quicker, dig deeper and stay longer. Bulletin 27 tells how to skidproof icy roads and streets. Write for it today.

CALCIUM CHLORIDE ASSOCIATION, 4145 Penobscot Building, Detroit, Mich.

CALCIUM CHLORIDE

FAST • POSITIVE • ECONOMICAL

MAKES ICY
ROADS SAFER
●
SAVES UP TO \$6.00
A MILE EACH
TREATMENT

3,100 Cu. Yd. Concrete Placed in 1 Day in English Airport

The W. H. Smith & Sons, Ltd., Construction, London, England, recently laid in one day 3,100 cu. yd. of 6-in. concrete pavement at an English airport. They used a central mixer set up at the intersection of each runway, each capable of output of approximately 600 cu. yd. There was another central mixer set up for access roads and several traveling mixers.

It was found that the most practical method was to construct two pilot bays down the length of each runway, and one around the perimeter track, with a travelling mixer working off the rough foundation of the parallel bay. The central mixers were then set up and worked along the pilot bays.

"Rubber Engine" Goes to War

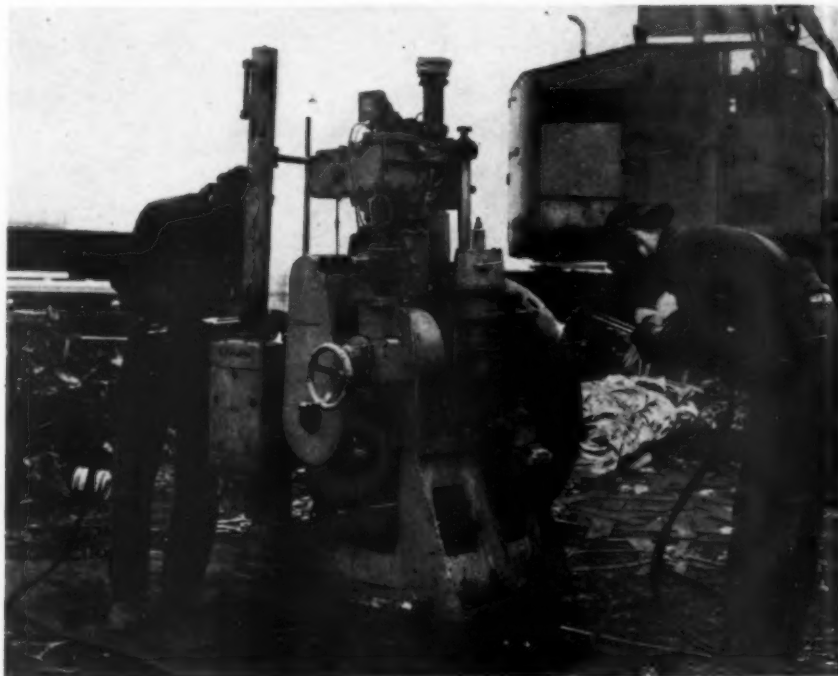
A one-cylinder test engine, used years ago for experimental work in connection with the development of the first "Caterpillar" Diesel engine, has gone to war.

Although treasured for its historical and sentimental value by research en-

gineers at Caterpillar Tractor Co., the 3,000-pound machine was recently cut up for scrap.

The "rubber engine"—so called because of the elasticity of design which

permitted an almost unlimited number of combinations of numerous variable factors to be made—was the "grand-daddy" of the Caterpillar Diesel engine.



Engine used in experimental work in development of first caterpillar diesel engine

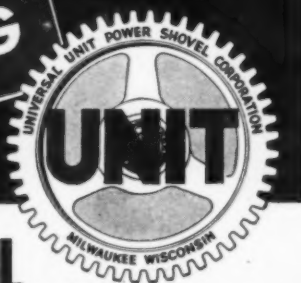
A NAME WORTH REMEMBERING

A POWER SHOVEL WORTH WAITING FOR

Today we are standing shoulder to shoulder with hard-hitting American industry in the gigantic task of producing essential war equipment to lick the Axis powers on all fronts. In this work we are making our engineering experience, heavy machinery production facilities and manufacturing skill count.

But when the dawn of the new day arrives, as it surely will, UNIT Power Shovels, Trenches, Clamshells, Cranes, Backfillers and Draglines will have a bigger job to perform than ever before. A shattered world will have to be rebuilt. And that will be a job for the most dependable, most flexible and speediest equipment.

Pending that "tomorrow" for which the world is waiting . . . "UNIT" is a good name to remember . . . and a Power Shovel worth waiting for!



UNIT 1020

¾ Yard Shovel

Other Sizes: ¾ and ½ yard. Interchangeable to all attachments.



The first joint Navy and Army "E" Award for war production excellence in the Milwaukee industrial area was granted to this company, in August, 1942. This official recognition of manufacturing efficiency, under the stress of factory conversion and realignment conditions, reflects a basic capacity for doing things the right way.

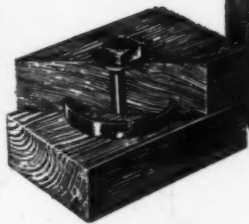
**UNIVERSAL UNIT
POWER SHOVEL CORP.**
MILWAUKEE, WIS., U. S. A.

num-
is va-
as the
pillar



WE'RE DOING A JOB "DOWNSTAIRS" TOO

The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.



This graceful 210-foot clear-span highway bridge is Timber Engineered under the TECO Connector System. Such bridges and trestles—from 30 feet span to over 3 miles in length—are carrying today the ever-increasing volume of America's war traffic. You, also, can now use the TECO Connector System of timber engineering for Strength, Speed and Economy.
Write Us Today.

Timber ENGINEERING COMPANY

WASHINGTON, D. C.

PORTLAND, OREGON

New Equipment and Materials

New Rock Crushing Plant

Pioneer Engineering Works, Minneapolis, Minn., has designed and is building a flexible plant. It can be used in either a rock quarry or a gravel pit. It will crush, screen, wash, and produce two or three sizes of finished aggregates. It can reject excess sand or produce "stone sand." For concrete aggregate, it will wash all

products, or if washed aggregates are not required, it can be used as a dry plant. To save time and money in moving on to the job and between jobs, each unit of the plant is mounted on tracks or wheels. The primary crusher is a Pioneer 30- x 42-in. overhead eccentric jaw crusher with welded steel base. Three roll crushers provide ample crushing capacity for any size or requirement. The New



Pioneer Rock Plant is a large capacity, flexible plant, for the production of all types of aggregates from either quarry or gravel.

New Air Powered Field Lubrication Unit

The Gray Co., Inc., Minneapolis, Minn., has added a new Graco Convoy Lubr to their line of portable lubrication units. The Model LU-150 Graco Convoy Lubr was designed primarily for the smaller contractor who doesn't need a large portable field lubrication unit, but who still feels the need of some sort of power lubrication of his construction equipment.

The model LU-150 Graco Convoy Lubr dispenses lubricant directly from original 100-lb. drums. This lubr is powered with a 4½ h.p. air-cooled gas engine, running a 12 cu. ft. air compressor, with a working pressure of 175 lbs. air pressure, supplying a 35-gal. storage tank. Three lubricant pumps dispense gear lube, track or hypoid lube and chassis lube. The easy loading feature of the model LU-150 is a feature which has made the drum type Convoy Lubr appeal to so many contracting firms. Four large hose reels with locking brakes



GET THE JUMP ON BUSINESS

Fast efficient operation is the keynote of today's means of doing business. To get the jump and keep the ball rolling requires not only good judgment but the tools to do the job right. And, when you put a SCHRAMM in the game you will get the outstanding performance that is needed to score on every job. Select the model best adapted for your needs . . . a 20, 60, 85, 105, 210, 315 or 420 cu. ft. capacity.

SCHRAMM INC., THE COMPRESSOR PEOPLE

WEST CHESTER, PA.



LIGHT WEIGHT
SELF STARTING
GASOLINE OR DIESEL POWER
COMPACT DIMENSIONS
ECONOMICAL ENGINE SPEED
AUTOMATIC CONTROLS
LONG LIFE
FORCE FEED LUBRICATION
COMPRESSOR EFFICIENCY

America Has A New "Main Street!"

the Alaska-Canada Highway, but it's Main Street for it's the reason why the Japaneses won't rename it "Alaskakuo" and up a puppet emperor over it.

You'll find Buckeye Clippers—the convertible shovels with vacuum control—working along Main Streets in cities all over America and in gravel pits, material yards and on excavating jobs off Main Street. And Buckeye Clippers made the dirt fly on America's new "Main Street." Subarctic weather is their friend—extreme heat or cold doesn't affect vacuum control.

Model 70 $\frac{3}{4}$ yd. Clippers were used, one of which is shown above. They're on many other vital war projects, too. It's Vacuum Control for Victory!

It's a people's war
—defend your
Liberty by buy-
ing war bonds.

BUCKEYE TRACTION DITCHER CO.

"Part of the Arsenal of Democracy"

Findlay, Ohio



How to Make Your Shovel Last Longer!

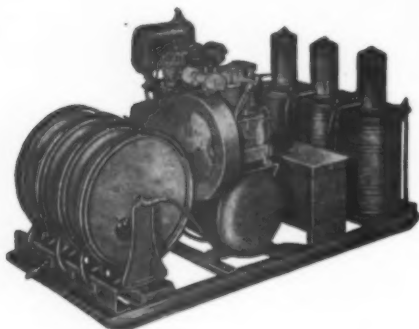
1. Keep dipper teeth sharp. (Saves fuel, oil and maintenance; increases production.)
2. Keep all parts well lubricated and clean. Accumulation of dirt gets into the moving parts and causes excessive wear and damage.
3. Don't abuse your shovel—lifting loads beyond its capacity—piling on extra counterweight—careless and rough operation.
4. Don't allow cables to cross wrap on the drum.
5. Keep crawler treads adjusted properly.
6. Don't use abrasive material on clutches and brakes. If grease gets on the linings, clean with gasoline.
7. Keep all joints on the vacuum system tight.
8. Change the oil in the motor crank case regularly.
9. Clean air cleaner regularly.
10. Use clean water in the radiator—flush it out occasionally.

Built by Buckeye

CONVERTIBLE SHOVELS, TRENCHERS AND BACKFILLERS, TRACTOR EQUIPMENT, R-B FINEGRADERS, ROAD WIDENERS AND SPREADERS



**CHECK
PAGE
25**



Model LU-150 Graco Convoy Luber

provide three 30-ft. high pressure lubricant hoses which make the largest equipment accessible to the Convoy Luber. A 50-ft. air line on the fourth reel quickly services large pneumatic tires of all kinds.

Earth Borer for Vertical or Inclined Holes

The power-driven hole digger here illustrated has been developed by Equipment Sales Co., 627 State St., Madison, Wisc., and named the "Speeddigger." It is designed for attachment to tractor, and operation by belt from tractor pulley. A tilting mechanism permits boring at any angle from straight down up to horizontal. While a 9-in. auger is standard, 5, 6, 7, 10 and 12-in augers are



available. The manufacturer states that the machine can be attached to a tractor in 9 minutes and detached in 2 minutes. Also that it digs a hole 38 in. deep in 20 seconds. The spacing of post holes and other holes evenly is accomplished automatically at any distance not less than 3 ft.

New Lamp for Welding

A new type spatterproof lamp for welding and rough industrial service has just been introduced by the

Radiant Lamp Corp., 260 Sherman Ave., Newark, N. J. The new lamp, known as the Radiant Spatterproof Lamp, is made of a special glass that resists penetration of hot metal particles, and it is built to withstand severe handling.

A new 200 watt lamp which is guaranteed not to crack due to climatic conditions, even when used outdoors in an open fixture, has been added to the company's line of weatherproof lamps for general lighting service. The complete range is now from 200 to 2,000 watts inclusive.

THE SAFE WAY

To Plow Snow—To Cinder Roads

INSTALL

KEYSTONE *Snow Plow* LIGHTS

ON YOUR EQUIPMENT



Pat. No. 2,380,375—April 21, 1942

Cut Down Accidents—Protect Lives

ORDER NOW WHILE WE CAN DELIVER

*Names of Users, Samples and Prices Furnished
Upon request on your Official Stationery*

AUTO GEAR & PARTS COMPANY

1410 WEST HUNTING PARK AVENUE

PHILADELPHIA, PENNA.

The snow plow must go through first to keep the Alcan supply line open and the chances are better than 10 to 1 it's a Wausau Snow Plow.

WAUSAU

SNOW PLOWS

Our 20 years of snow plow engineering experience building Truck, Tractor and Grader plows was called upon in the maintenance of the world's newest and most important highway. We are pleased with this recognition.

WAUSAU IRON WORKS
WAUSAU, WISCONSIN



ROTOTILLER

TRADE MARK REG. U.S. PAT. OFF.

ROADMAKER



**Builds HIGHWAYS,
AIRPORT RUNWAYS,
LANDING STRIPS**
faster, better, more
economically.



**WET or DRY, the 4 speed "3-in-1
Rotary Action" gives a BETTER,
MORE UNIFORM PULVERIZED MIX**

These are days of fast construction schedules and labor shortages. Roadway contractors and airport construction engineers want road-building machines that give superior performance. In the early days of soil-cement construction, back in '37, the FIRST soil-cement areas and roads constructed were made with ROTOTILLER. One of the first airport runways constructed with this revolutionary "3-in-1 rotary action" machine was praised by pilots as "the smoothest runway we ever came in on". It is noteworthy that these and similar pioneer soil-cement jobs were built with early ROTOTILLER models; 1943 models are even better and incorporate practical improvements suggested by contractors themselves.

Today, more and more soil-cement and stabilization work on highways, landing strips, airport runways, and landing fields is being done. ROTOTILLER Roadmaker with its patented, perfected "3-in-1 rotary action" assures more accurate control in wet and dry mixing, as well as more thorough pulverization of materials. The scientific, spring-tine rotary action thoroughly mills the earth from top to bottom, resulting in complete pulverization and mixture to any depth up to 10 inches. You get all this in ONE operation—a better job at lower unit cost and with substantial savings in time and labor. Weighs, ready for work, only 3020 pounds—rugged, dependable.

See ROTOTILLER Roadmaker in action and you'll see why road and airport contractors consistently prefer this superior roadbuilder.

AND, AFTER THE WAR . . . Post war reconstruction plans undoubtedly will include the building of thousands of miles of soil-cement and oil stabilized secondary roads. This work will be fostered as a means of giving employment to returning soldiers. Then, as now, ROTOTILLER Roadmakers will be on the job.

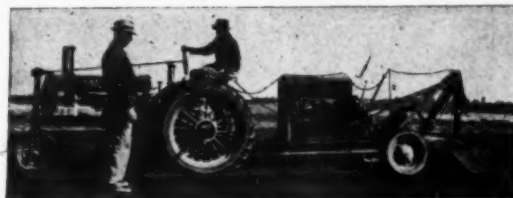
Send for Illustrated folder and Technical data.

ROTOTILLER, inc. TROY, New York Dept. P



**ORIGINATORS OF
"3-in-1 ROTARY
ACTION" TINES**

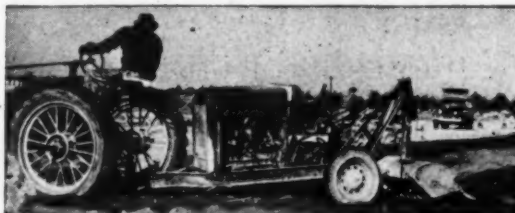
Only ROTOTILLER gives you
this 4 speed "3-in-1" mixing
and scarifying combination.



Early model ROTOTILLER building one of the first military airports to use soil-cement. After two hard winters, runways are reported still in first class condition.



With ROTOTILLER Roadmaker mixing can be done close to forms as shown in this illustration. ROTOTILLER can be used with almost any type tractor.



On the job ROTOTILLER saves time, speeds construction by making sharp turns without taking tines from the ground or stopping machine.

ROADS AND STREETS, January, 1943

Personal Items about Engineers

G. DONALD KENNEDY resigned as State Highway Commissioner of Michigan late in December to accept an appointment as Vice-President for Highway Transportation in the Automotive Safety Foundation. He began his new work in Washington on Jan. 1.

Governor Van Wagoner immediately appointed LLOYD B. "DUTCH" REID, Deputy Commissioner, to succeed Kennedy.

After declaring that Kennedy was "the best highway commissioner Michigan has had," the Governor expressed his great admiration for and confidence in Mr. Reid's abilities as an engineer and administrator.

CHARLES E. HAYES has been appointed Metropolitan Engineer in charge of the Detroit office of the State Highway Department, G. Donald Kennedy, State Highway Commissioner of Michigan, announced last month. Mr. Hayes succeeds JOHN H. MCCARTHY who, on leave from the department, is serving as captain in the

newly formed Michigan ordnance company.

FRANK KELSO, Wyoming state highway superintendent since 1939, has resigned and will leave office January 18. His resignation was announced by G. F. Schoonmaker, chairman of the state highway commission. Mr. Kelso had sought to resign nearly a year earlier, but had continued in office at the commission's request until the practical completion of the 1941-1942 construction program.

CLARENCE E. STAHL, of Stillwater, Minnesota, who has been serving with the Missouri River Division, Corps of Engineers has been promoted to the rank of Lt. Colonel. Stahl is a veteran construction man, having been associated with railroad and state engineering activities throughout the Mid-West.

WARDNER G. SCOTT, state engineer of Nebraska, has been elected president of the Association of Western State Engineers.

JOHN BEAKEY, for 14 years employed as traffic engineer by the state highway commission, of Oregon, will become a captain in the army transportation division. He will be stationed in Portland. Beakey has been given a leave of absence and will return to his job at the close of the war.

Inspectors Needed in War Department's Production Protective Service Continues

Application for Inspector positions in the Production Protective Service of the War Department continue to be accepted by the U. S. Civil Service Commission. The positions are extremely important to the war effort, as the inspectors will function for the protection of some 6,500 major factories engaged in war work. The salaries for these Inspector positions range from \$2,600 to \$5,600 a year, but applications are particularly sought from persons who are qualified for and will accept salaries of the grades from Junior Inspector at \$2,600 to Senior Inspector at \$3,800 a year.

Inspectors will be responsible for making recommendations to prevent interruptions or delays in the production and delivery of all types of war material caused by major accidents, explosions or other hazards inherent in manufacturing plants. No written test will be given. Applicants will be rated on their education, experience, and personal qualifications, as soon as possible after the applications are received at the U. S. Civil Service Commission, Washington, D. C.

The requirements are: General experience in performing inspectional and professional engineering advisory services for manufacturers, as inspector in a property insurance rating bureau, as plant protection supervisor or master mechanic in a large industrial establishment, or as professional engineer specializing in plant protection work. Appropriate college study may be substituted for part of the experience.

Applications will be accepted until further notice, but qualified persons are urged to apply immediately unless they are already using their highest skills in war work. Announcements and applications may be obtained at any first- or second-class post office or from the U. S. Civil Service Commission in Washington, D. C. War Manpower restrictions on Federal appointments may also be consulted at these offices.



GETTING THE JOB DONE WITH...

WARCO

IN TIME OF WAR AND PEACE . . . Warco better-built motor graders do the job faster and easier with the simple and powerful HYDROMOTOR. The Hydromotor gives quick, positive action to all operating adjustments.

W. A. RIDDELL CORP.

MANUFACTURERS OF BETTER-BUILT ROAD MACHINERY
BUCYRUS • OHIO

New Trade Literature

The Use and Care of Wire Rope.—“Machinery—whether it be a motor car, a delicate watch for milady’s wrist, or a shovel capable of lifting many tons of earth—requires proper care and attention to assure satisfactory operation. Wire rope is generally considered as a machine. It is composed of numerous parts in the form of wires, strands and cores—and these parts, when exposed to strains or bending stress, engage in limited, yet positive movement. Thus—the proper use, care and lubrication of wire rope is just as important to service, performance and economy—as it is to any precision made machinery. Abuse of many kinds must be guarded against—and errors in application and maintenance eliminated if full satisfactory performance is to be secured. That is why this book was written—to offer a guide covering the use and care of wire rope—facts and suggestions that will prove both informative and helpful.”

The above preface explains why American Steel and Wire Co. prepared

its 52-page booklet, “Valuable Facts about the Use and Care of Wire Rope.” The major subjects treated—with excellent text and illustrations—are: Unreeling and Uncoiling; Kinks; Seizings; Fittings; Splicing; Lubrication; Gauging; Safety Factors; Grooves; Effects of Bending; Common Causes of Wire Rope Failures.

The booklet, measuring 4 x 8¼ in., is adapted to either desk or pocket use. It was copyrighted in 1942, and may be obtained from American Steel and Wire Co., Rockefeller Bldg., Cleveland, Ohio.

Strain Gages and Their Use.—Three new technical bulletins, one describing the company’s SR-4 Strain Gage and the other two, the recording and indicating instruments for use with SR-4 Strain Gages, have just been issued by the Baldwin Southwark Division of The Baldwin Locomotive Works, Philadelphia.

The bulletin on the SR-4 Strain Gage which describes an entirely new and revolutionary method for determining stresses in structures and ma-

chines, gives detailed descriptions of the three standard gages, their application in measuring and recording dynamic and semi-dynamic strains, and instructions for installing the gages on structures to be analyzed.

Contained in the two other technical bulletins, the SR-4 Strain Recorder and the SR-4 Portable Strain Indicator, are detailed descriptions of the two instruments, and installation operating information for their use with SR-Strain Gages.

Asphalt Institute Issues Emergency Revisions of Its Construction Specifications

To conform with Recommendation No. 61 of the Petroleum Coordinator for War, as approved by the War Production Board, limiting the number of asphalt grades, The Asphalt Institute has made the necessary changes in its various construction specifications and issued them in pamphlet form with the title, “Construction Series No. VI—Emergency Revisions of The Asphalt Institute Construction Specifications.”

Copies are available, without charge, upon request to The Asphalt Institute, 801 Second Ave., New York, N. Y.



ARMY E NAVY

● The coveted Army and Navy E Pennant awarded for excellence in production now floats proudly above the Wellman plant.

WILLIAMS Buckets

ARE BITING INTO FROZEN GROUND and TROPIC MUCK

● Williams Buckets are very much in active service in the wide-flung war offense. Concrete-hard, frozen ground is being broken by the sharp teeth of Williams Buckets in far north road building. Deep in jungles Wellman Buckets are digging and dredging. At ore mines, over stock piles and railway cars, and in steel mills Williams Buckets are literally moving mountains to help beat the Axis.

built by
THE WELLMAN
ENGINEERING COMPANY
 7003 Central Avenue • Cleveland, Ohio

GRUENDLER'S FIFTY-EIGHTH YEAR

For Access Road and Air Base Construction

PORTABLE CRUSHERS

Proper Size Aggregates—on the job

Balanced, Non-Tipping. Expertly designed to meet your exact requirements in proper size aggregates—larger capacity and quick mobility to and from job.



GRUENDLER
CRUSHERS • PULVERIZERS • GRINDERS

Four Wheel Maintenance JAW CRUSHER with Power Unit

GRUENDLER CRUSHER & PULVERIZER CO.
2915-21 N. Market St., St. Louis, Mo.

Write for Catalog
No. 601



3/4
Cu. Yd.

8'
Lift

FRONT END SHOVELS

for Industrial Tractors

Write for Catalog

Elkhart White Mfg. Co. Indiana

There are Hundreds of Snow Plows
on the Alcan Highway and

NORGAHN

- MOLDBOARD GLAZE
- WINGSLIDE COMPOUND
- HYDRAULIC FLUID

Will Improve the Performance of
Every One of them

WRITE FOR COMPLETE DATA

NORGAHN COMPANY, WAUSAU, WIS.

Snow Plow Specialties

DIRT MOVING EQUIPMENT

Highway construction involves more dirt moving than any other branch of engineering construction. **ROADS AND STREETS**, the only national engineering construction magazine devoted exclusively to, and covering all sections of, the highway field is the most effective and economical medium through which to sell dirt excavating, grading and hauling equipment.

CORONACH

"Of those immortal dead who live again

in minds made better by their presence."

JOHN C. WHITE, civil engineer, a veteran of the first World War and a public official of Westchester County, N. Y., died on Dec. 16, aged 49. The Veterans of Foreign Wars conducted a service at the Edwards Funeral Home, Dobbs Ferry. There will be another service in Philadelphia.

Born in Landsdowne, Pa., Mr. White was graduated from Swarthmore College in 1915. He lived in Hastings for several years. He was secretary of the Westchester County Tax Commission, a former assessor of Greenburgh township and former village clerk, treasurer, assessor and engineer of Hastings-on-Hudson. Mr. White served in the Thirty-third United States Army Engineers Regiment in the first World War.

THOMAS D. SINGLETON, civil engineer of long and wide experience, died at Vicksburg, Miss., on Dec. 21. He was 68 years old.

Mr. Singleton graduated from the Virginia Military Academy where he majored in civil engineering. He began active practice at the turn of the century, and was engaged in practically every phase of the profession in many of the Southern, Southwestern and Eastern seaboard states. He also practiced in Paita, Huacho, Lima and Miraflores, Peru, where he was in charge of surveys for public utilities in those cities.

He became associated with the Vicksburg engineer district in 1928 and remained in the service of that agency until the time of his death. During the period of service with the Vicksburg engineer district he was engaged in construction work on the Mississippi river and its tributaries and was active in the acquisition of lands for the construction of the Sardis and Arkatubula dams.

Mr. Singleton saw three years' service in the Philippines during the Spanish-American and Philippine wars, served in China during the Boxer Rebellion and was a member of the Veterans of Foreign Wars.

JAY T. ELLISON, veteran assistant commissioner and chief engineer of the Minnesota State Highway Department, and a member of the Executive Committee of the National Association of State Highway Officials, died suddenly on Christmas Day. He was regarded nationally as one of the deans of highway engineers.



Jay T. Ellison

Mr. Ellison had served as an assistant commissioner of the Minnesota Department since the establishment of the state's trunk highway system in 1921, first as second assistant commissioner and chief bridge engineer from 1921 to 1925, and since that time, as assistant commissioner and chief engineer. Born July 6, 1881, at Winnebago, Minnesota, he attended country schools in Minnesota and

Iowa in the days when horses and wagons struggled to school and town through the snow buried roads of winter and the deep mud of rainy springs and autumns. After two years of high school at Emmetsburg, Iowa, he moved to St. Paul to complete his education at Hamline University and the University of Minnesota, from which he was graduated in 1909 with the degree of civil engineer. He began his professional career as a mining engineer for the Shenango Furnace Company of Chisholm, Minnesota, became a draftsman designing steel work for the Minneapolis Steel and Machinery Company and served for a short time as engineer in charge of a drainage survey for Norman county, Minnesota.

Mr. Ellison entered the Minnesota State Highway Department in 1911 as an engineer in the bridge division under the old three man Highway Commission. He became district engineer in 1916, and in 1917 was appointed chief bridge engineer for the State Highway Commission, assuming charge of all bridge plans and construction on state aid roads. Up until the adoption in 1920 of the trunk highway amendment to the State Constitution, Minnesota's state government lacked authority to directly construct or maintain any highway. The adoption of this amendment, however, and the enactment of the subsequent legislation created the original Minnesota trunk highway system, and with the establishment of the present State Highway Department, Mr. Ellison was appointed second assistant commissioner and chief bridge engineer by the late Commissioner Charles M. Babcock on April 1, 1921. In 1925 he was advanced to assistant commissioner and chief engineer of the entire department.

During his more than 30 years of service to the state, he was as closely and intimately associated with Minnesota's highway development, both state and county, as any other man. He witnessed the transition from thousands of miles of dirt roads where teams and wagons mired down during every spring break-up, to the present 11,000 mile system of modern, rural highways which have made the tourist business Minnesota's third largest industry.

Acceptance of his counsel and utilization of his experience in the road and bridge construction field, however, was by no means confined to Minnesota. He served at various times as president of the International Highway Association, president of the Mississippi Valley Conference of State

Highway Departments and as vice-president of the National Association of State Highway Officials.

MICHAEL E. WHITE, Sr., widely known paving contractor and business man, head of White Consolidated, Inc., of Chicago, died Dec. 31. He was 80 years old.

Born in the town of Oak Creek, Wisc., Mr. White started his career as a brakeman on the Chicago and North Western railroad. He became a conductor and later ran construction camps for the railroad. He became associated with the Barber Asphalt Co., and handled their Milwaukee plant. The White Paving Co., organized about 1915, performed many important jobs, including sewers and other public works, as well as paving in the Middle West. Mr. White several years ago brought his interests, which included extensive real estate holdings, together into White Consolidated, Inc.

E. C. FINK, president and chairman of the board of Mack Trucks, Inc., died in New York City on Jan. 1st following a heart attack suffered a few days earlier. He was 62 years old. A pioneer in the truck industry, Mr. Fink had been an officer of the company since its organization in 1911 following a consolidation of the Mack Bros. Motor Car Co., the Hewitt Motor Co. and the Sauer Motor Truck Co. He was for many years vice-president in charge of production at the company's plants in Allentown, Pa., Plainfield, N. J., and New Brunswick, N. J. In this capacity he supervised the development of Mack truck, bus and fire apparatus models over a period of years that saw far-reaching changes in the design and construction of motor vehicles and in the extension of their use. Mr. Fink was elected president and chairman of the board in January, 1937, succeeding the late Charles Hayden. Born in Cincinnati Mr. Fink started his career with the old machine tool firm of Lodge & Shipley, thus acquiring the practical first-hand knowledge of machinery that was to guide him so successfully as an executive. He later served with the Prentiss Tool and Supply Co. and the Stevens Arms Interests. As head of Mack Trucks during the present war he was the guiding hand in the design of the specialized motor trucks Mack is supplying the armed forces and in the development of the huge Mack-built transmissions now used in many of the Army's 30-ton tanks.

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in SURFACE TREATMENT

to reduce cover loss to one-quarter or less.

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to lengthen life in pile and yet speed setting-up.

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to attain required stability regardless of water content.

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GOVERNMENT CONSTRUCTION

KOTAL COMPANY

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With the Manufacturers

Completes Civilian Orientation Course

S. F. Baker has returned to his duties as vice-president of the Thornton Tandem Co. of Detroit, having just completed the Civilian Orientation Course presented by the Command and General Staff School of the United States Army at Fort Leavenworth, Kan. Mr. Baker, a World War I flyer, was one of



S. F. Baker

a group of 87 men selected by Lieut. Gen. Brehon Somervell to participate in this condensed General Staff officer's course. This group was chosen as a cross section of all types of business and professions interested in war activities. The purpose of the course is to familiarize this repre-

sentative group of civilians, most of whom have had military experience, with the streamlined structure of the new Army, as well as an over-all view of the tasks confronting the Army in the current war. It was purposed by the War Department, to create, in this manner, a group of informed citizenry who may act as a liaison between military and business groups for the purpose of facilitating co-operative efforts between industry and the country's military organizations.

Abelt Elected Director of Chain Belt

At a recent meeting of the Board of Directors of Chain Belt Company, A. R. Abelt, secretary of the company, was elected a director to replace Mr. F. J. Weschler of the Baldwin-Duckworth Division who died recently. In addition to being made a director of the company, Mr. Abelt was also elected a vice-president. A. R. Abelt

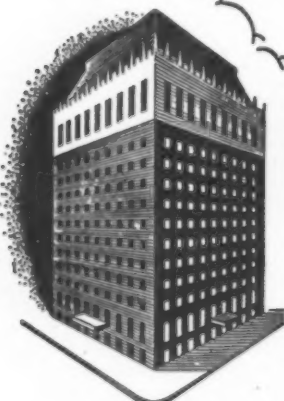
joined the Chain Belt organization in 1907 as a very young man and literally grew up with the company. He has served it in many capacities which have included production, sales and executive work. In 1922 Mr. Abelt was made sales manager of the Chain Belt and Transmission Division, a position he retained until early in 1942 when he became manager of that division. He has been secretary of the company since 1930. Mr. G. D. Gilbert, sales manager of the Baldwin-Duckworth Division of the company, which is located at Springfield, Mass., has been made general manager of that division and also elected secretary of the company to succeed Mr. Abelt. Mr. Gilbert entered the employ of the Duckworth Chain and Manufacturing Company in 1918. He was made sales manager of that company in 1924 and was successively sales manager of the Baldwin-Duckworth Chain Corporation and the Baldwin-Duckworth Division of Chain Belt in 1939. He is also a director of Chain Belt Co.

Highway Accidents in Indiana Reduced 30%.—On the basis of reports for the first eleven months, a reduction of 30 per cent in accidents on the state highway system is indicated.

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141 Canada Cement Co., Montreal, Que., Can.

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ARE MADE in a complete line of
sizes to fit all standard compressed air
hammers.

Send for NEW Vulcan illustrated CATALOG today.

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QUINCY, MASS.

R. B. Harvey Appointed Chair- man Contractors' Pump Bureau

R. B. Harvey, Sales Manager of the
Novo Engine Co., was appointed
chairman of the Contractor's Pump
Bureau at their annual meeting in
Chicago. The Pump Bureau is an or-
ganization composed of the principle
manufacturers of contractor's pumps.
This bureau determines all standards
of the manufacture of pumps used in
the construction industry. Mr. Harvey
has also been recently appointed to

the Contractor's De-watering and
Engine Industry Advisory Committee
Supply Pump Manufacturer's Advis-
ory Committee and the Air-Cooled
of the War Production Board. These
committees were appointed to pro-
mote workable standards and greater
simplification of procedure between
the various manufacturers and the
requirements of the War Production
Board.

Wietersen Appointed Director of Purchases for Buda

The Buda Co. has announced the
appointment of R. C. Wietersen, Di-
rector of Purchases, for The Buda Co.
He is in complete charge of purchases
of equipment and material for Buda
gasoline and Diesel engines, radial
Diesel engines, railroad equipment,
lifting jacks, Dieslight generator
sets, Earth Drills, and industrial shop
trucks—all products of The Buda
Company. Mr. Wietersen is well
known in the engine industry and
comes to us with considerable knowl-
edge and background. Mr. Wietersen
for the past two years was Director of
Purchases for the National Supply
Co. (Superior Engines), Springfield,
O. For four years prior to that he
was with Hercules Motors of Canton,
O., as their Director of Purchases.
He spent 13 years with Studebaker
Corp., South Bend, of which ten of
these years he was Assistant Pur-
chasing Agent.

William C. Carter Elected President of Link-Belt Company

Link-Belt Co., manufacturers of
materials handling machinery and
power transmitting equipment, an-
nounce that William C. Carter,
for 14 years vice-
president and for
the past year executive vice-presi-
dent, has been
elected president,
effective Dec. 31,
to succeed Alfred
Kauffmann, who
has resigned be-
cause of ill



William C. Carter

health. Mr. Carter, a mechanical
engineering graduate of the Univer-
sity of Illinois, joined the Link-Belt
Pershing Road Chicago plant organi-
zation in 1902 as a draftsman. He has
consecutively held the positions of en-
gineering department supervisor,

MULTIFOOTE CONCRETE PAVERS

Single drum 27-E and 34-E models.
Also tower and inclined boom
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For Black Top paving and rock
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Heaters, Thawing Torches, Ground Thaw-
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construction superintendent, plant
superintendent, plant general man-
ager, vice-president in charge of pro-
duction. He has been executive vice-
president in complete charge of com-
pany affairs since Mr. Kauffmann's
illness. Mr. Kauffmann, who has so
ably served the company for 41 years,
rising from draftsman in 1901 to
president in 1924, is retiring from
active service in order to recover his
health. He remains a member of the
Board.

Hercules Awarded Army-Navy "E"

In a letter from the War Depart-
ment dated Dec. 19, 1942, and signed
by Under-Secretary of War Robert P.
Patterson, the Hercules Motors Cor-
poration, Canton, O., was informed
that the Army-Navy "E" award has
been granted to the men and women
of the corporation for production ex-
cellence. The presentation was made
by Colonel Harold M. Reed at the
company's Canton plant on Jan. 11.

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4" Rex Self Priming Pump—Gasoline
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- 1—Railroad Steam Asphalt Plant. 1000
Lbs. mixer
- 2—10,000 gallon Asphalt storage tanks
- 2—8,000 gallon Fuel Oil Tank
- 1—Buffalo-Springfield 3 wheel 13 ton
steam roller
- 1—Iroquois Tandem 10 ton steam
roller
- 1—Austin Western 8 ton gas roller
- 1—P. & H. 1/2 yard steam clam
- 1—Bucyrus 1/2 yard steam shovel and
clam
- 1—Koehring Paver 10 E.
- 5,000 Lineal feet of 5 and 12 inch
metal forms
- Asphalt tool wagon and asphalt tools

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WANT TO BUY

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er Graders, Batch Boxes, etc.

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Column Clamps, Complete Air
and Electric Tools, Towers,
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drive and steer—9.00 x 24 dual
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- 1—Caterpillar "60" gasoline tractor.
- 1—Atcoo scraper to fit Cat. "60".
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- 3—20,000 gallon capacity storage tanks
- 30 x 10 Portable CRUSHING PLANT
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- 18 in. x 200 ft. BELT CONVEYOR
- 1/2 yd. Owen CLAMSHELL
- 2—1,000 ft. DIESEL AIR COMPRESSORS
- 30—1 1/2 yd. and 3 yd. DUMP CARS
- 4 ORANGE PEELS—4 to 27 ft.
- 100 H.P. Lambert three drum ELEC. HOIST
- 5 Parsons & Cleveland TRENCHERS
- 2—2 1/2 and 3 ton tandem gas ROLLERS
- 1/2 yd. P. & H. Gas Cat. Dragline
- 5—4 to 10 Ton Gas Locomotives
- 1 Vulcan & McKiernan Terry Pile Hammer
- 5 Sunite NI & N2 Cement Guns
- 4 KW Kohler lighting plant

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- 1—1 1/4 cu. yd. Northwest Dragline.
- 5—G. M. Diesel Driven Euclids.
- 1—R D 7 Caterpillar LeTourneau Bul-
ldozer.
- 1—Allie-Chalmers Baker Bulldozer.
- 1—Adams Tandem Drive Motor Grader.
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- 1—95 Northwest Dragline
- 5—Euclid Trac-Truks
- 3—Caterpillar Bulldozers
- 1—Caterpillar Motor Patrol

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Large Quantities of Adjustable Build-
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Army-Navy "E" to Edwards Division of Rogers Diesel and Aircraft Corporation

On Nov. 30, 1942, at Sanford, N. C., the Army-Navy "E" was awarded to the Edwards Company, a division of the Rogers Diesel and Aircraft Corporation, New York, N. Y. The company and its employees received this award for outstanding excellence in performance and production.

Courtright of Marion Promoted

At a recent meeting of the Board of Directors of The Marion Steam Shovel Co., Marion, O., John P. Courtright was named Vice-President in Charge of Sales. This is to take effect immediately. Until now, and since a year ago, Mr. Courtright has been Director of Sales of the company.



J. R. Courtright

Mr. Courtright's sales experience with The Marion

Steam Shovel Co. dates back to 1927, when he became a salesman for the company in the Chicago district territory. In 1936 he was made District Manager of the same territory. His success here earned for him the position of Sales Manager over all Districts in 1937, when he moved his headquarters to the home office.

Allis-Chalmers Springfield Works Receives Army-Navy "E"

The coveted Army-Navy Production Award was made to the employees of Allis-Chalmers Manufacturing Company, Tractor Division, at the works at Springfield, Illinois on January eighth. The ceremonies, held at four P.M., were attended by a large number of appreciative friends of both management and crew.

Heacock of Caterpillar Goes to WPB

B. C. Heacock, Chairman of the Executive Committee of the Caterpillar Tractor Company, was appointed in December as Director of the Priorities

Control Division of the Distribution Bureau of the War Production Board.

Mr. Heacock's division is charged with the responsibility of integrating the Production Requirements Plan, and the priorities system as a whole, with the Controlled Materials Plan; implementing determinations of the Requirements Committee; processing applications for special and emergency ratings; and clearance of War Production Board orders.

Renewal Star for Broderick & Bascom's Army-Navy "E"

Continuing the high record of war production which earned the All-Navy "E" for them last April, employees of Broderick & Bascom Rope Co., St. Louis, have won a renewal star from the Army and Navy. The added star—affixed to a new joint service flag, presented at a brief renewal ceremony on Dec. 16—denotes extension of the honor for another six months.

The Associated General Contractors will not hold a general convention in 1943.



Who is the man who used this shower?

Want some clues? He slept well last night and now he's enjoying his breakfast. He intends to call on his Baltimore customers today, spend the night here and hop a fast train (45 minutes) to Washington tomorrow morning to tackle some business there.

Who is he? He could be you on your next trip to this territory—using this famous hotel in this famous city as your convenient headquarters in this busy area.

We can make better arrangements for you if we know you're coming. Reserve your room in advance.



The LORD BALTIMORE HOTEL

BALTIMORE • MARYLAND

700 rooms—each with radio, tub and shower





Cut YOUR MIXING Costs

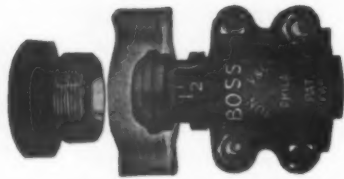
Modern bituminous mixing equipment is essential in meeting short time limits on many defense projects, but the production of this equipment is necessarily limited. While this company's facilities are being used entirely in the war effort, a limited number of bituminous plants for defense purposes are available.

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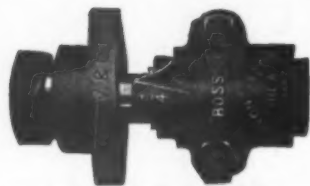
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For steam, air and hydraulic hose. Washerless construction provides leakproof, trouble-free seal between stem and spud. Strong malleable iron "BOSS" Interlocking Off-set Clamp has great gripping power—no danger of blow-offs. Swivel wing nut facilitates connecting and disconnecting. SIZES: 1/2" TO 4", INCLUSIVE.



"GJ-BOSS" GROUND JOINT AIR HAMMER COUPLING

Same washerless construction as Style X-34 coupling, above. No lost or mislaid washers to replace. "BOSS" Interlocking Clamp anchors coupling to hose with powerful, evenly distributed hold. COMPACT TYPE, STYLE XLB-61, 1/2" AND 3/4". HEAVY TYPE, STYLE XHB-72, 3/4" AND 1".

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ROADS AND STREETS, January, 1943

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